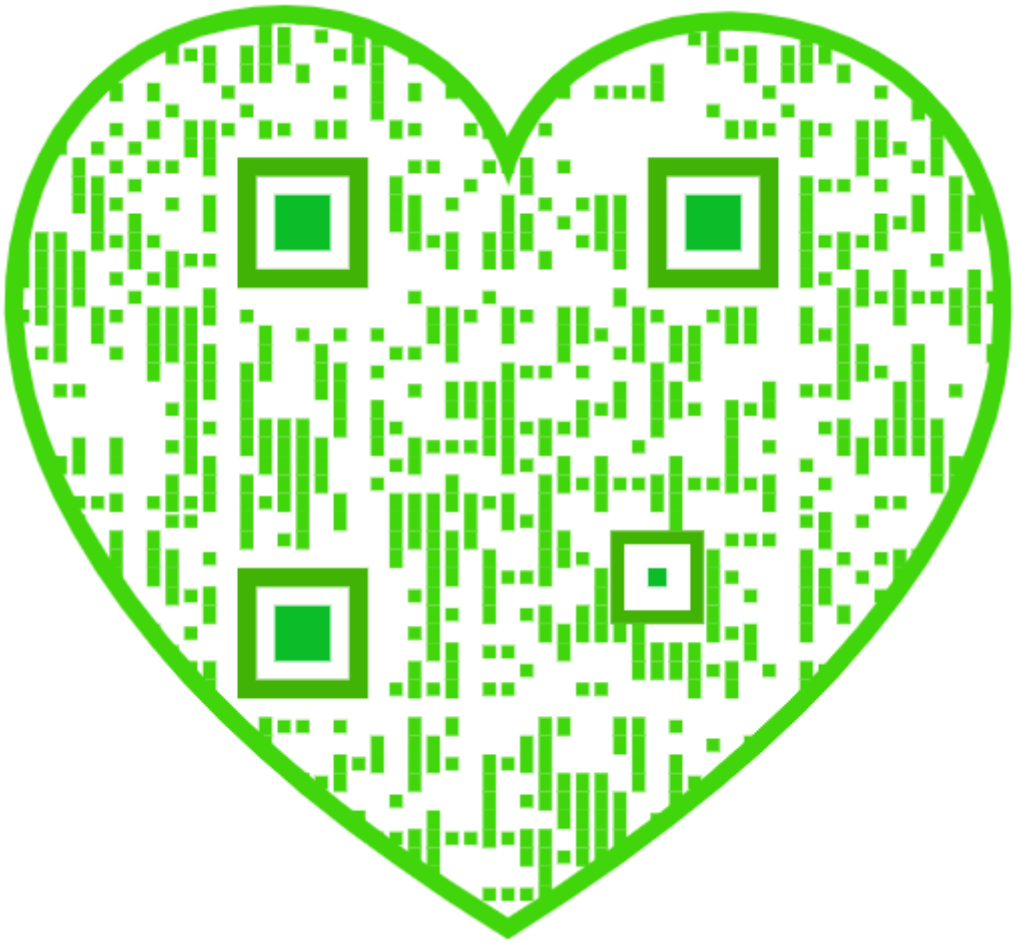

PRACTICAL SURGERY.

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WITH

One Hundred and Twenty Engravings on Wood.

BIBLIOTHECA BARKERIANA

BY

ROBERT LISTON,

SURGEON.

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PREFACE.

THE following work on "Practical Surgery" was planned in the spring of the present year, and executed during the summer months, in those hours which the author could snatch from his professional engagements in public and private.

The aim throughout has been to produce a work which should be useful to the students of surgery and young practitioners,—a plain common-sense view of the most important injuries and diseases which are met with in practice, unencumbered by speculations or theories, and accompanied by simple directions how to conduct the treatment. The good intentions of the author must be placed against the imperfect execution of the task.

If the arrangement of the work, as may be expected from the above announcement, be defective in some respects, the same cannot be said of the illustrations, which have all been planned, drawn, and engraved in the same short period. These are the joint production of the Messrs. Bagg. It is hoped that the beauty of the designs, and the correctness in execution, may put the reader in good humour, and avert in a slight degree his displeasure, if he think there be reason.

The author cannot find terms strong enough to express the sense he entertains of the services he has received at the hands of Mr. Bagg, jun.; as also from Mr. W. J. Erasmus Wilson, whose assistance was most handsomely and readily afforded throughout the entire work, in making dissections, and inventing the best plans for displaying the different subjects.

The author, moreover, is bound to express his obligations to his excellent friend and late assistant, Mr. James Miller, now practising in Edinburgh, (whose valuable aid he had in preparing the "Elements of Surgery" for the press,) for the chapter on "Restoration of Lost Parts." He was too happy to accept of Mr. Miller's kind offer to extend for him some short and very meagre notes on the subject, considering that he had but a very limited period allowed for completing the work. There is one error of the press, by the way, in this chapter, the eighth, which the reader will be so good as correct with his pen, by striking out the letter *s* from the word cheiloplastic in page 225 near the bottom.

London, 12, *Old Burlington Street*,
October 19, 1837.

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INTRODUCTION.

It has been well and truly remarked, by the celebrated Desault, "that the simplicity of an operation is the measure of its perfection;" and the same test may, with great propriety, be applied to other curative means, internal as well as external. Simplicity ought to be studied in all our dressings, in our applications to recent solutions of continuity, and to the various breaches of surface of old standing and continuance. This opinion has been gradually gaining ground. The boiling oils, hot dressings, filthy unguents, greasy poultices, stimulating plasters, and complicated bandages, must give place, very soon, where as yet they have not done so, to the "elegant substitute for a poultice," to the unirritating isinglass plaster, and to careful position of the injured part. No less is it advisable to avoid all complication in the apparatus for adjusting and retaining solutions of continuity, in the different parts composing the skeleton, and for remedying congenital or accidental deformities. Our "armamentaria" should contain simple and efficient instruments only; the springs, grooves, notches, and sliding blades, in many instruments, being intended to compensate for want of tact and manual dexterity—to enable those who have not made the art of surgery a study, to bungle through those operations that chance.

or official situation may throw in their way, or put within their grasp. The apparatus, though simple, ought to be in good order: "et prompta semper habeat instrumenta; nam in iis, penuria detrimentosa est et artem inopem facit;" says Rionalus. In cases of disease or accident, by the careful employment of mechanical means, combined with judicious constitutional and local treatment, recourse to the last remedy, operative procedure, can very often happily be dispensed with; many fractures, for instance, which, under bad management, would very likely be followed by mortification, or extensive suppuration, by death of bone, or articular disease, may, by being kept steady, rendered independent of the motions of other parts, placed so as to favour the return of blood, and thus to do away with the risk of inflammatory engorgement, be brought, without suffering or hazard to the patient's life, to a favourable termination. A more intimate acquaintance with pathological changes, and therapeutic agents and means, has abridged very much the field of operative surgery. Such operations as are still, of necessity, resorted to, are, from more enlightened views of the actions of the animal economy and the resources of nature, stripped of much of their severity, and rendered much less hazardous and formidable; amputation, for instance, is not now performed, in one out of twenty cases, in which it was had recourse to for diseased joints, hardly a century ago. It can be safely effected in a twentieth part of the time which is often, even at the present day, occupied over it. The operations for fistula, stone, aneurism, &c., &c., are now, in the hands of the practised and well-qualified surgeon, completed safely, quickly, and, in comparison, pleasantly. In the nature of things, however, many operations can never be dispensed with. Displacements and injuries must be reduced, adjusted, and retained; morbid growths still resist discutients, and must be taken away before the parts in their neighbourhood are vitiated, and before they interfere seriously and prejudicially with the functions of a part. Foreign bodies cannot always be prevented from effecting a lodgement in canals and cavities; these must necessarily be removed. The morbid

contractions of such organs, and accumulations in them, can only be got rid of by recourse to operation. If many of these operative procedures are not conducted with great caution, skill, dexterity, and tempered boldness, the patient may be brought into a very hazardous predicament. It behoves, therefore—indeed it is the bounden duty of every one engaging in the practice of our profession, in addition to a correct knowledge of the *science of surgery*, the causes, symptoms, and consequences of disease, the signs of injuries, the morbid changes on the tissues involved, to make, moreover, the *art of operating* the subject of most careful and diligent study. Not that it is by any means advisable or necessary that every practitioner should prepare himself for the performance of the more difficult or capital operations, as they are sometimes denominated; these being perhaps entrusted with greater propriety to those whose opportunities of seeing and treating surgical disease are ample and constant.

To put out of view the safety of the patient, a person not in the habit of operating can scarcely be remunerated for the anxiety and risk which he incurs in a difficult and serious case. There are many operations and manipulations, however, which all should be prepared and ready to undertake without hesitation or delay—many of the minor, and some few of the more dangerous and troublesome. The art of operating has been, even by many of those in prominent situations, too lightly considered and too little practised on the dead body. For the foundation of the study of the art of operating, must be laid in the dissecting room, and it is only when we have acquired dexterity on the dead subject, that we can be justified in interfering with the living. Many poor creatures have been sacrificed in consequence of the ignorance, carelessness, and self-sufficiency even of scientific professors, who have either despised or neglected the study of surgical anatomy, the considerations of what may arise during this or the other operation, and the due education of their fingers. The infliction of unnecessary pain, through want of adroitness in the use of instruments, by protraction of any proceeding, the hazarding in the slightest degree the safety of any one who

puts confidence in us, who trusts us with his life, or of one who, as in public practice, is, as it were, by chance, without the means of appeal, thrown into our hands, cannot by any means be palliated, or defended—it is in point of fact highly criminal.

Accuracy of diagnosis, confidence in our own resources, promptitude in applying means in an emergency, can only be attained by study at the bedside of those suffering under disease or injury. It is only by experience, by collecting and arranging facts which may serve as precedents, that expertness in manipulation is to be acquired, and it is within reach of any one who will take pains, and who will seize every opportunity of acquiring dexterity.—Were the recommendations given above better followed, we should have presented to us fewer of those scenes shocking to humanity, which have been so well described by one of the most interesting writers on surgery; the operators are represented as agitated, miserable, trembling, hesitating in the midst of difficulties, feeling in the wound for things the position of which they had not understood, turning round to their friends for that support which should come from within, holding consultations amidst the cries of the patient, or even retiring to consult about his case whilst he was bleeding, in great pain, and awful expectation. With a view of exciting a more intense and lively interest in, and facilitating the study of, practical surgery, and of rendering less frequent the occurrences above reprobated,—occurrences so degrading and detrimental to our profession,—the present work has, in a great measure, been undertaken.

PRACTICAL SURGERY.

CHAPTER I.

ON THE DIVISION OF PARTS BY THE KNIFE, &c.

THE absolute necessity for the performance of a surgical operation having been clearly indicated, (the injury or disease, under which the patient labours, being of such a nature, as to render the part, in which it is situated, unserviceable, or of such severity as evidently to be wearing out his constitution by violent and continued suffering, or destroying his health and threatening his existence by excessive and wasting discharges,) the first consideration that ought to occupy attention, is the state of mind and feelings of the sufferer, the condition of the digestive organs, and of the circulating system. These being all in a favourable state, the patient having full confidence in the resources of our art and of those who are to exercise it upon him, being anxious moreover to have his life prolonged, determined, in fact, if possible, to make a good recovery—his different secretions being in a healthy state—his stomach, bowels, and kidneys being all in good order, and his circulation quiet,—the less delay in resorting to operative procedure, and the shorter the period of uncertainty and suspense in which the patient is kept, the better. In the preparations for the more serious and difficult operations more especially, it will be the surgeon's duty to procure proper assistants, and to make

sure that they all understand what is expected of them. The operator should consider well the place which he himself should occupy during the proceeding, so that he may, without awkwardness or change of position, be able to effect his object efficiently and gracefully; he will also act wisely in general, so to dispose the instruments and apparatus, that he can at once put his own hand upon them, and thus render himself independent of lookers-on, who, in nine cases out of ten, owing to anxiety or curiosity, or to their hurry and agitation, hand anything but what may at the instant be required. If he have had experience in such proceedings, he will previously have ascertained that everything is in order, that the cutting instruments have good points, that their edges are keen, and that the joints of forceps and scissors move freely and readily.

All incisions, more especially through the skin, the most sensible part of the animal machine, should be effected with rapidity, and in such a way as to give as little pain and shock to the nervous system as possible. With this view, the parts must be put completely on the stretch, and the knife applied so as to effect the solution of continuity without pressure or bruising. The fingers of the operator are to be so disposed (those of the right or left hand otherwise unemployed) as to render the parts about to be incised tense; the thumb is placed on one side, and the pulps of the fore or other fingers, according to circumstances, are spread out on the other. In effecting more extensive separation of parts, the fingers of an assistant are opposed to those of the principal. These dispositions being properly made, the division should at once be effected to the desired extent. A surgeon who can use either hand equally well, or nearly so, in holding and managing his instruments, possesses very great advantages. It is almost immaterial to him, in many of the smaller operations, in what position his patient is placed in regard to him. A great deal of awkwardness and unnecessary exposure is thus often saved. In many operations, as venesection, the opening of abscesses in different situations, the division of fistula in ano, the extraction of or reclination of a cataract, &c. &c., this must often be noticed and

felt. By a little practice, the facility of moving steadily the fingers of either hand is attainable, and surgical pupils are much to blame who do not take every opportunity of acquiring ambidexterity.

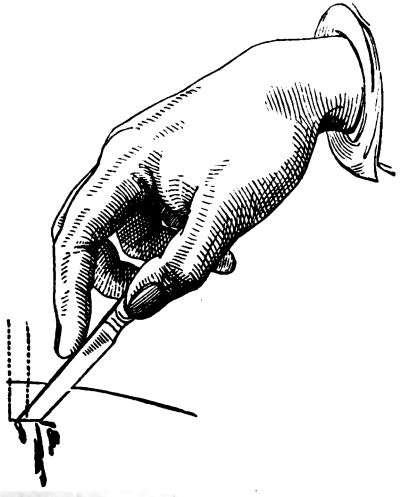
The cutaneous tissues, and in many instances the subjacent parts, should be divided by a single incision, rather than that the patient should be tormented, and the feelings of those who witness the proceeding hurt, by seeing the process effected by slow and tedious procedure, bit by bit, as it were. Incisions may be made either from without inwards, (from the periphery to the centre,) or from within outwards. In either case, the principle upon which the instrument is made to cut, must be well considered. Every knife is to be looked upon as a fine saw; the teeth of some are, or ought to be, set forwards, as, for instance, the cornea knife, and the bistouries for some amputations; these cut best from point to heel, as does a razor. The greater number, however, are properly set otherwise, and act efficiently only in being drawn from heel to point. It can be readily understood, that the pain experienced in the division of parts, must be in proportion to the pressure and the rapidity of execution in the application of the instrument. The art of cutting clean, of dividing the parts with celerity and neatness, can be acquired only by much practice. The stiff style of manipulation acquired, and generally pursued in the dissecting-room, must give place to a more free, light, though still decided mode of handling the knife. The free motion of the wrist-joint must be superadded to the practised and more steady actions of the fingers. And if agility and address are to be acquired by constant study and practice in the elegant exercise of the small sword, why should not grace and splendour, as was the boast of Hildanus, be equally attainable by the surgeon and by similar means? In cutting from without inwards, throughout the whole extent over which the knife is drawn, the skin should be at once and freely divided, together with the subcutaneous cellular tissue. The pain of partially dividing the cutaneous tissues, tails being left at either end, is very intense, and such incisions are not so available as they might be for the intended purpose of evacuating fluid, permitting the ex-

traction of foreign bodies, or for the dissection of morbid growths. The pausing of an operator in the midst of a dissection, and the resort to fresh and more extensive incisions of the coverings is always an awkward and cruel-looking step, and attended with much additional and unnecessary pain to the patient.

The form and size of the instrument ought always to be in proportion to the extent of the proposed incisions, both as regards their length and depth: nothing can possibly be imagined more abominable or cruel, for instance, than the attempt (which has to my knowledge been repeatedly made, and which I have in fact witnessed) to remove the lower extremity of a full-grown person with a common scalpel or dissecting-knife. If an extensive incision is necessary, an instrument presenting sufficient length of edge must be employed, so that the parts may be separated smoothly and quickly. The point of cutting-instruments should either be in a line with the back, which ought to be perfectly straight, or again, both back and edge should be so far convex, the point being in the middle of the blade. An experienced surgeon will choose an instrument well balanced, and in a steady handle; and he will hold it differently, according to the object he has in view. Should he be required to cut on important parts, to perform a delicate dissection of the living tissues, he will choose a short-bladed instrument, with a handle rather long and well rounded; he will, after the superficial incisions are effected, hold it as he would a writing-pen, lightly but firmly, so that he can turn the edge and cut either towards or from himself, as occasion may require. A small well-made scalpel, with a good point, and less convexity than those usually employed, is the instrument best adapted for such a purpose. The handle should be perfectly smooth and polished, as, in fact, ought to be the handles of all instruments, in the use of which, delicacy of touch is necessary. Some practitioners have carried fashion so far, that many even of the catheters and sounds to be found in the instrument maker's collections, are fitted with wooden handles deeply grooved. The inventors seem to have been more afraid of losing hold of the instrument, in a fit of agitation and panic, than intent upon

fitting it for its legitimate purpose, and using it in a proper and workmanlike manner.

Again, for cutting upon infiltrated tissues, into collection of matter, for the dissection of loose tumours, or for exposing dead bone, a broad-bladed bistoury, large or small, as may be necessary, is preferable; for smaller disarticulations, &c., a narrow bistoury will be found more suitable. The instrument may, according to the steadiness of the operator's hand, and the resistance he expects in separating the tissues, be held near the further end of the handle betwixt the points of the middle finger and thumb, opposed to each other, or be grasped at the joint in the same manner, the blade being steadied by the fore-finger advanced along it, whilst the end of the handle rests on the ball of the little finger. The position of the fingers must be changed a



little, as the direction of the point or edge of the bistoury is varied. In dividing the skin, the knife, whether a scalpel or bistoury, is to be held and entered, with the point and blade at right angles to the surface. It is carried with a decisive movement down to the subcutaneous cellular tissue; the blade is then inclined, and made to approximate the surface to be divided, and by a rapid and slightly sawing motion, with a certain degree of pressure, (as little as possible, much more being done by art than by force,) the object is effected to the desired extent.

The incision is finished, by again bringing the knife into a perpendicular position as regards the surface, and so as to divide the entire thickness of the covering to the point of withdrawal.

The skin may, in some instances, be divided readily by having it raised in a fold from the subjacent parts betwixt the fingers and thumb of the operator and assistant; the heel of the blade of the bistoury is then applied to the interposed part at the apex of the fold, and, by pressure and slight sawing motion, carried down to its base.

It is by such an instrument, used as above directed, that cavities containing purulent or other fluids are to be opened. The broad-bladed, sharp-pointed bistoury in a folding handle, fixed, when open, by a spring catch, is preferable, and in all respects a more surgeon-like instrument than the abscess lancets which are generally employed. When an inflammatory swelling has attained considerable size: when it is plain, from its duration, from the pitting of the œdematous surface, and from the boggy sensation communicated to the finger, that pus has formed; when, from the depth of the fluid and the nature of the superimposed parts, the patient suffers great pain, and when there is no apparent prospect of a speedy thinning of the coverings, pointing, and spontaneous evacuation of the fluid, no delay ought certainly to take place in giving relief, by a free opening. This proceeding may be justified and rendered imperative at a very early period, in consequence of the situation of the abscess over bones or joints, or in the neighbourhood of canals or cavities, the functions of which might be thus interfered with, or their structure destroyed. The knife is to be entered steadily, and with its blade in a perpendicular direction to the surface; it is pushed onwards until resistance ceases, and the point is found to move more freely. By withdrawing the instrument a little, the oozing of purulent fluid will confirm the supposition, entertained by the feeling conveyed to the hand, that the cavity is perforated. The superimposed parts are then divided, by a rapid sawing motion, to the requisite extent. In some cases, the knife must be entered very deeply, in order to reach the matter; and this may

safely be done, even in regions containing important organs, due regard being had to the position of these. The vessels and nerves are, however, displaced and removed from the surface by the morbid accumulations, and the knife is passed right down upon their course and to such a depth as would endanger them very materially in the normal state, without coming within a considerable distance of them; this may often enough be observed in abscess of the neck and behind the angle of the jaw, when energetic and proper treatment is adopted. Delay, in such cases, is inadmissible, in every point of view, from the extreme pain, the immediate symptoms caused by interference with the respiratory and alimentary tubes, and the probable consequences. The opening ought at once to be made clean and patent, so as to give a free exit to the contained fluid, and that without any thumbing or squeezing of the exquisitely tender and painful parts around. Much pain and fever is thus saved, and the necessity for extension of the opening, or for making counter-openings, is done away with. It may so happen, that, in spite of the best management, as regards the situation of an opening for the evacuation of pus, and the after management, that the fluid does not escape freely, that it falls down below the level of the aperture, or a case in which the opening has at first been badly placed may present itself; the enlargement of the original incision may then suffice for the complete emptying of the cyst, or it may be more prudent and judicious practice to effect a fresh one. In some of these cases, the thinning or discoloration of the integument will mark the proper place, and the point of a bistoury can at once be plunged into it; in others, again, an examination by a probe, directed by the escape of matter, upon pressure around, may be advisable; and upon the end of this, or of a grooved probe substituted for the first and exploratory one, an incision may be made. Occasionally, to preserve the free drain of fluid, for a time, in the proper direction, a silk thread may be drawn from the one opening to the other, or a little slip of lint, smeared with oil or ointment, or moistened in tepid water, may be inserted with the flat end of the eye probe.

It ought to be recollected, that an opening of an inch in length, quickly and smoothly made, is attended with as little, if not

with less pain, than a coarse and hazardous plunge of an abscess lancet, which will be found, perhaps, to have barely penetrated the cavity by an aperture of not more than two lines, the object, after all, being inefficiently fulfilled. The opening must uniformly be made at that part of the abscess which is most likely to be generally dependent; the state of the patient, and his probable position for some time after this little operation, must be, with that view, considered beforehand.

In some few cases, more than one opening had better be made, even in the first instance. Abscesses, extending over a considerable surface, cannot readily be got to discharge freely through one opening; and it is in vain to hope for suspension of discharge and contraction of the cavity so long as matter is permitted to lodge. For instance, the abscess which is met with over the ligament of the patella, caused by bruise, and often resulting from inflammation of the bursa in this situation, it is generally necessary to treat in this fashion: if one opening is made in the middle and the front of the limb, the fluid falls down and separates the skin from the fascia, on both the tibial and fibular side; counter-openings, after a day or two, will be found necessary, and perhaps, after a time, will require to be repeated. All these are rendered unnecessary, the cure is abridged, and, upon the whole, the patient is saved much pain, by the properly directed and scientific course of proceeding already indicated. In badly treated cases of the kind, sinuses have been cut up, sometimes, across the course of the fibre and limb, and bandages and compresses have been applied, for months, in vain. Small and superficial chronic abscesses, far advanced, are more speedily brought into a healthy and well-disposed state when they are opened by a bit of potass—as will be directed by-and-bye—than when evacuated by recourse to the knife.

Abscesses which have fallen into the substance of a limb, or which have been formed in the intermuscular cellular [illegible] ought, on no account, to be permitted, through hesitation or delay, to acquire a great size. These abscesses are slow of coming to the surface, and they are not attended with pain, or much inconvenience: the secreting surface becomes gradually

more extensive; but the secretion is slow, and the absorption keeps pace with it, in some measure, for a time. When, however, the cavity is exposed, and air is admitted, inflammatory action of the lining membrane is apt to ensue. The discharge becomes much vitiated, then bloody and putrid; tremendous constitutional disturbance, and irritative fever of a most alarming character ensue, which are greatly aggravated if the fluid have not a free exit. These abscesses are sometimes met with of an enormous bulk, and of very long standing.

A gentleman consulted me in the summer of 1834, on account of a supposed solid tumour on the inner aspect of the thigh, and the nature of the swelling was explained to him. It was a cold abscess of many months standing, and contained perhaps six ounces of matter. In the end of 1836, I was again called to see the same tumour. It had then surrounded the limb, and contained many pints of fluid: the parietes had begun to thin at two points, and a speedy opening of the cavity was inevitable. The patient, about the middle period of life, still enjoyed tolerably good health. On his return to the country, an incision was made into it. All went well for six or seven days; matter became confined; a violent attack of fever immediately ensued; this was followed by epidemic catarrhal fever, then prevalent. Sunk to the lowest degree of exhaustion and debility, he again came to town with a most fearful discharge, cough, and all the symptoms of hectic fever, and after a very short time died exhausted. Had this abscess been opened two years earlier, and freely, in all probability everything would have gone on well.

The practice recommended by the high authority of the late Mr. Abernethy, and at one time much in vogue, has now, so far as I know, been abandoned. It consisted in making a small indirect opening into the cyst, which was, after a partial evacuation of the contents, again closed. A few cases did well, the opening being repeated at intervals; but the greater number of patients were put in great jeopardy, by the local excitement, accompanied, as it almost uniformly was, by violent fever. In opening chronic abscess, the dependent point is to be chosen; the opening should be free

and direct, made by inserting the bistoury as already explained, and enlarging the puncture in proper form: matter must by no means be permitted to lodge and this is provided against by counter-opening if need be. The common and thoughtless practice of squeezing together the sides of suppurating cavities, whether chronic or acute, ought to be, by all means, discouraged. The patient, it is true, seems to be relieved at the time from a greater load of matter, but much pain and positive injury is thus inflicted and entailed on him. The surfaces so treated are apt, from the mechanical injury, to inflame, the vacuum occasioned is filled by air or rapid secretion of bloody serous or gaseous fluid, if not by escape of blood from the vessels, deprived of their accustomed support. The after discharge is profuse and most offensive, and this is accompanied by a dangerous excitement of the system, an intense irritative fever, and delirium.

Puncture by a trocar, is sometimes had recourse to for the evacuation of matter from chronic abscess; and it is the mode generally pursued in evacuating fluid from serous cavities. This mode is also resorted to where it is desirable that the discharge should have vent as it is secreted; and where different layers, loosely connected, cover a collection of fluid, this proceeding is generally advisable. Instances in point will be given in the course of the work, and the proper mode of proceeding directed and delineated.

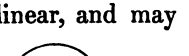
Punctures are made with the point of a lancet or needle through the integument, in order to empty the cellular tissue of serosity, when from its presence the superimposed parts are much distended, and the deeper tissues compressed. The instrument is held betwixt the fore-finger and thumb lightly, and the middle finger is passed along the blade to prevent its perforating more deeply than necessary, should the patient be unsteady. These small incisions should be as strictly made in the direction of the fibres as larger ones, in order that deformity and other unpleasant consequences may be avoided. Punctures are also made with needles, grooved or not, to ascertain the contents of swellings. This practice will be adverted to in another

place. Punctures with needles are sometimes made deeply into muscular parts to relieve painful affections, and often with astonishing effect. The instrument, held betwixt the thumb and fore-finger by its head, is inserted with a slight rotatory motion, the course of larger vessels or nerves being avoided. The skin is often punctured at two points, and the intervening and subjacent cellular tissue divided, so as to contain a foreign substance, a skein of cotton or silk, or a piece of Indian-rubber tape, with the view of exciting and keeping up discharge, and thus causing a derivation from more deep disease. This operation of inserting a seton is performed either with a broad needle, which is thrust through a fold of integument, pinched up; or it may be effected by the common broad bistoury and eye probe, the probe being slid along the blade of the knife, partially withdrawn.

The preliminary incisions in many operations, both of the smaller and greater kind, can be made more quickly with much less pressure, the parts being completely on the stretch, by reversing the proceeding and cutting from within outwards. An instrument, varying in shape according to circumstances, and the uses it is afterwards to serve, is pushed across the part under the skin, which, if loosely attached to the subjacent parts, is raised from them as above directed. After the point has emerged, (the puncture being made and the transfixion completed,) the edge is turned towards the surface, and quickly brought through the superimposed parts. Some abscesses can be thus conveniently and cleverly opened, and for this purpose a narrow, straight, or curved, sharp-pointed bistoury is used. In many cases of hernia, and of tumour, the coverings can be so divided by a small scalpel, or broad-bladed bistoury; and in the greater number of amputations much pain and after annoyance is saved by following this method, cutting from the centre towards the periphery of the limb.

The forms and extent of incisions on the surface of the body, must necessarily be suited to the objects the operator has in view. The simple incision, which, for good reasons, to be given in the succeeding chapters, ought, without exception, to be made longitudinally, as regards the limbs and neck, and which on the

trunk ought to be made to follow pretty uniformly the course of the subjacent muscles, may, unless carried to an immoderate extent, be insufficient for the exposure and removal of morbid growths, of decayed and dead parts of the animal economy, for the extraction of foreign bodies, and for the exposure, for instance, of any part of the osseous system, which it may be thought advisable and expedient to divide or remove. Exceptions must occasionally be made to this rule, as for instance in the subcutaneous abscess of the neck, in which case the position and direction of the natural folds of the integument are to be preferred for the opening, with the view of preventing deformity as much as possible.

A portion of integument must, in many cases, necessarily be turned aside, for the purposes above indicated, and for many others. An incision, forming some part of a large or small circle may be made by a dexterous turn of the knife, and by carefully stretching the parts during the process. The course of the incision may be curvilinear, and may terminate or finish a straight incision, thus:  Such irregularly shaped incisions are often contrived so as to embrace in their course sinuses or papillæ, which discharge the accumulations from suppurating cavities, or lead to dead parts. Again, by such deviations from a straight line, a portion of integument may be readily dissected back, in order to expose the subjacent parts, and enable the surgeon to effect more perfectly the object of his operation.

But in a great variety of cases, a more extensive exposure of the subcutaneous tissues, normal or abnormal, is requisite; and for this purpose the skin must be divided, so that a flap or flaps, as they are called, can be turned aside. Two cuts may be made to diverge, or meet or form of incision. The most at a point, being the convenient mode of effecting this object is, the skin being well and carefully stretched, to make a slanting incision of sufficient length, and at the one or other end of it to commence another, which shall diverge at a more or less acute angle, according to the circumstances of the case. It will generally be advisable to arrange so that the apex of the angle is dependent. A square flap may be formed by making

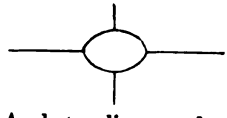
two incisions fall upon the ends of a transverse or longitudinal one, so—

Again, two flaps may be turned aside, after incisions such as these:

Many of these incisions are made by cutting from within outwards, and they should be so planned, that the parts shall be well put upon the stretch, and that the second and incident cut shall not go beyond the one which it is made to meet. Two flaps may sometimes advantageously be made by such arrangement of the longitudinal and cross incisions, as these. It becomes occasionally necessary to turn

aside the skin very thoroughly, and to a considerable extent; and with this view four flaps are formed by the crucial incisions,

In some cases a complicated form of incision is required, for which no rules or plans can be laid down or given. For instance, in exposing vascular growths, so as to surround them by ligature, it may be necessary to remove part of the integument, and still further to divide them by the turning back of flaps. I had occasion to do so the other day in a case of subcutaneous erectile tumour on the shoulder of a child. Part of the integument was discoloured and adhered to the subjacent mass, an original nævus maternus, but the boundaries of the tumour extended far beyond. In order to circumvent the diseased parts, it was found necessary to make incisions thus.



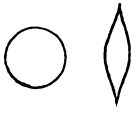
And to dissect the

intervening integument from the surface of the tumour to the requisite extent.

Regard must be had in the planning of all these incisions to the nature of the injury or disease, to the situation of wounds or openings, to the size of the injured or diseased parts, to the extent of our contemplated proceedings, and the direction of the subjacent fibres. The application of all of them will be shown by reference to the different chapters.

Circumstances now and then demand the removal of part of the skin; this proceeding ought, when possible, by every means to be avoided and shunned. The cutaneous tissue is capable of immense extension, as is seen during many natural processes, and in the growth and increase of external and internal tumours; and we know that after accouchements, and after the evacuation of serous collections in the abdominal cavity, the extended parts soon regain their normal condition, and tightly embrace the partially emptied cavity. The coverings of external tumours of enormous size bear great distension, but to render this less rapid and inconvenient, the integument is borrowed, as it were, from the neighbouring parts. The skin of the penis, perineum, abdomen, and groin, contributes to cover and support any large scrotal tumour. If in such cases integument is removed to any extent, with the false notion that there will be an exuberance of this structure, it will be discovered, when too late, that the cure, instead of being retarded by redundance of skin and bagging of matter, will often be delayed from deficiency of covering and slow healing of the exposed surface. The extensibility of the skin is well seen, after the loss of the scrotum by sloughing, by the rapid covering which is afforded to the exposed organs from the surrounding cutaneous tissues which are, in a measure, borrowed and well spared by the neighbouring parts, the perineum, groins, and hypogastrium. In all cases, when the skin is not thinned to a great degree, and altered in structure, it will be prudent to leave nature to deal with it, when laid down in position, after the removal of the offending part. In such cases, however, great care must be observed as regards the approximation and retention of the edges, and the formation of a dependent

opening, so as to prevent accumulation of blood, serum, or pus, at various periods of the cure. Cases frequently occur where, in consequence of diseased action, inherent in, and propagated to, the skin, or in which, from intimate adhesion of the coverings to the subjacent parts, these must of necessity be extirpated to some extent. To embrace such portions of the external coverings of diseased parts, incisions must be made of a circular or elliptical form.



The latter, if possible, is to be preferred, and in many situations, after much loss of integument, still the divided edges may be brought into close or nearly immediate contact, so that the period of cure shall be but little protracted. Such forms of incision as above represented, especially the latter, may occasionally be conjoined with the simple division to a certain extent, thus. The various plans above given must of course be varied and modified according to the nature of the case, and the judgment of the practitioner; for here, as in all other matters, there is no rule that does not admit of an exception.

In making incisions upon important parts, a young surgeon may act wisely in separating, one by one, the layers of condensed cellular tissue and fascia from each other, raising them by sliding a grooved probe or director under, and then dividing them by drawing the edge of his knife in the groove, or pushing its back along it. This proceeding is advised and too much resorted to in the operation for hernia, and more so in that for aneurism; much delay and pain is thus unnecessarily occasioned without any additional security, and even dangerous consequences may follow the practice. The highly injurious effect of lacerating the cellular tissue around a large vessel, and separating it extensively from its connexions and vascular supply, will be hereafter insisted upon. With a little practice, incisions may be made upon the most delicate parts, and without risk, by the hand unsupported, one layer being cut up after the other. If any instrument is wanted to make the proceeding more safe, if layers closely

investing a hernial tumour, for instance, which has been well handled, are to be cautiously raised from it, or if the sac contains little if any fluid, and it embraces the contents very closely, perhaps is adherent to some extent,—then well-made dissecting forceps may be useful, and the more so if the operator has not had experience in the matter, and cannot readily and cleverly use the nails and joints of his fingers.

In opening suppurating fistulous tracks in the cellular tissue, and in making counter-openings, a strong and long probe, or director, may occasionally be wanted: a pretty full sized grooved probe with an eye at one end, and with the groove open at the other, is the most suitable and useful instrument. It is passed along the sinus—a narrow, blunt-pointed, straight, or crooked knife is slid along it, and the handle raised from the guide, if the object is to divide the whole extent; or, again, a sharp-pointed bistoury may be pushed along the track to its extremity: the point is made, by depressing the handle, to penetrate the coverings from within, and, with a sliding and drawing motion, the superimposed parts are laid asunder. In many cases, by a judicious manipulation, the probe-pointed knife, or even the sharp-pointed one, may be employed without any guide. The division of living tissues cannot be made by scissors, to any extent, with advantage; the proceeding is a painful one, and the surfaces must be more contused, than when cut by the proper application of a well-set knife. Union, accordingly, cannot confidently be reckoned upon, after operations so conducted. It may be advisable to substitute scissors or concealed and sliding knives for the more simple instruments, in performing some few operations on children, or on nervous and unsteady patients, more especially in situations difficult to reach. The rules to be observed in making incisions in the deeper seated parts, so as to avoid important parts, nerves, and vessels, so as to save blood, and to enable the operator to get safely and quickly through his undertaking, without exhausting the nervous power of his patient, will be treated of fully in describing some of the capital operations, those for the removal of tumours, &c.

Having given so much consideration to the division of parts, it may now be proper to say something of the circumstances that arise out of such proceedings. Hæmorrhage is always the most alarming occurrence, and the most dangerous, if allowed to proceed to any extent, and is that which demands the most prompt attention.

By position of parts, in many instances, bleeding will be put a stop to at once, more especially if it proceed, in a great measure, from venous branches. This is often seen after an extensive division of parts, for the purpose of relieving tension, evacuating the contents of vessels, or fluids which have been effused into the cellular tissue, in cases of violent inflammation of the surface. It is always desirable to see that there is no obstacle to the return of venous blood, after many of the greater operations, as amputation; the ligature of many open mouths, which would be and are generally secured, may be thus avoided. Bleeding from veins may always be arrested by removing the obstacles to the return of blood, and by slight pressure, if need be, after that. The danger from ligature of this part of the circulating system is now well understood and appreciated, and the practice generally eschewed. The open extremities of arterial branches, if small, may be prevented from pouring out their contents to a prejudicial extent, by the application of cold around the part, by astringents from the mineral and vegetable kingdoms, and by slight pressure. Vessels of a larger class had better have their extremities closed at once, by the proper application of a ligature; this should be effected with as little disturbance of neighbouring tissues as possible. If the cellular substance is loose and fine, no difficulty will be experienced in pulling out the open end of the vessel, by the use of the common dissecting forceps, or sharp hook, tenaculum, as it is commonly called. When no assistant is at hand, the surgeon will find the advantage of possessing a pair of forceps with well-fitted points, and which are held closely in contact by a catch or slide; these are now to be had of the various instrument makers, of a much less clumsy form than heretofore.

In seizing the open mouth of a vessel with forceps, the point of

the instrument may be introduced into the canal, or both sides may be seized at the same time; the mode of proceeding must depend upon the state of the surrounding cellular membrane and sheath. Some vessels, in parts admitting of much motion, as the facial and others, are so loosely attached, that their cut extremities project, and they can even be seized by the nails, or points of the finger and thumb; or, indeed, a ligature may now and then be thrown around, without any evulsion whatever. The ligature is sometimes hung over the forceps or tenaculum, with a noose upon it. It is more advisable that the assistant should take hold of the ligature, (one of small, firm, round, hempen thread, well waxed, about twelve or sixteen inches long, is to be preferred,) quite free, and make first one hitch and then a second upon the bleeding point. He can thus take care to turn the ends of the ligatures, so that a "good, honest, devilish tight, and hard" knot, one which cannot, by any possibility, become relaxed and slip off, shall be made. It is not necessary for any surgical purpose that there should be any "quibbling provision made by the implication and return of the two ends of the strings through the annulus, or noose, made by the second implication of them, to get them slipped and undone." No chance ought to be thrown away in tying ligatures; they must be so secured that there shall be no excuse for their slipping. It would answer no purpose to dilate here upon the impropriety of including veins or nerves in the noose of the ligature, along with the arteries of any considerable size. It is often impossible to avoid taking in the sheath of small branches; the accompanying veins and portions of muscular substance, and now and then nervous twigs are included, and the more so when parts are divided which have been involved in inflammatory action. Great difficulty in securing bleeding vessels occasionally results in such cases; retraction or contraction of the vessels does not take place in consequence of the surrounding cellular tissue being infiltrated. From the same cause, it is not an easy matter to separate and pull out the open mouth, so as to seize it; and it becomes occasionally necessary to carry a ligature round the bleeding point, by means of a curved, sharp

needle. It is impossible, by words, to explain the preferable mode of deligation; the knot should be what, by seafaring men, is known as the reef-knot, and is shown in the sketch, page 32. What is called the surgeon's knot, that in which the ends are passed twice through the first noose, is, or ought to be, out of use and forgotten. It is not applicable to the ligature of vessels, if the clean division of the inner coats and the intimate apposition of the surfaces is desired. A puckering must be occasioned by it, prejudicial to the cure, and the second noose does not apply well over the first. This knot may sometimes be employed in tying deep-seated tumours, where it is not possible to apply the finger or an instrument, to prevent the simple one from slipping. In that case, the end of the ligature must also be twice passed through the second noose.

After the application of a ligature to a vessel of the first class, the carotid subclavian or iliacs, it is, in my opinion, advisable to leave both ends hanging from the wound. Though the knot is properly made and firmly drawn, the surgeon may have misgivings as to the risk of the ligature becoming slack, and of the knot becoming undone by the constant and forcible impulse of the blood. It may be desirable to diminish the size of the foreign body in the incision, in order that the excitement and discharge may be as slight as possible; with this view it may be considered proper to remove one end of the thread, or perhaps to take away both. In either case, it will be a judicious and safe procedure to apply a third knot, taking care that this shall be made after the fashion of the others, the two ends coming out evenly and opposite each other, without any awkward twist. The advantage gained by taking away one of the ends must be but very slight. If a foreign body is to be left hanging out throughout the whole depth of the wound, it matters little whether it is composed of one or two threads.

The practice of cutting off both ends of ligatures was at one time very much in fashion. It was thought that the mere noose or knot might by possibility remain imbedded in the living tissues, surrounded by a cellular cyst, and occasion no annoyance

and again it was fondly imagined and hoped, that by employing ligatures of animal substance, tendon, cat-gut, or fish-skin, that the noose, after answering its purpose of closing the vessel for a sufficient time, might be removed by the absorbents, and thus occasion neither irritation nor annoyance. It has never yet been explained, however, by the advocates for this practice, why the absorption of the ligature should take place exactly at the favourable period and not before. Nor has it been shown that it does so at any period, whatever the substance employed may have been. All these hopes have been disappointed; ligatures, of whatever substance, do now and then remain hid for a long time, but very generally they occasion trouble; they, perhaps, after the cure has been thought complete, give rise to irritation, pain, inflammatory swelling and formation of matter; abscess after abscess ensues, one knot comes out after another, and ultimately all the offending foreign bodies may be expelled; but the perfect recovery is thus very long protracted. In all wounds likely to heal at an early period, the one end of the ligature on the smaller vessels had best be cut off, close to the knot, and left only of such a length, as to project but little from the surface of the integuments. They should be brought out at one or other end of the incision, and, if possible, the whole, or the greater number, at the most dependent extremity. In such wounds as it is not advisable or possible to bring together, both ends of all the ligatures may be cut off close to the surface of the wound.

It is well-known that a vessel which has been torn across, furnishes little if any blood, and this, as will be afterwards explained, arises from the elongation of the cellular coat and the corrugation and retraction of the internal one. The process has been imitated from time immemorial by surgeons, in suppressing the flow from some vessels; but of late years an attempt was made to persuade the profession to adopt the practice in all cases, and in all situations, to the exclusion of the ligature. The plan succeeds very well in vessels of the second class, such as those of the forearm: but it is not very safe in those of larger size, and it is inapplicable to the smaller twigs; these cannot be

pulled out and separated from the nerves and other tissues around. And if ligatures are applied to any, it is as well to treat all alike. The practice as recommended above, is the safest, and in all points of view quite unobjectionable.

The arrest of bleeding may occasionally be effected by judiciously applied pressure. This object may be attained temporarily by compression of the vessel or vessels betwixt the heart and wound. If continued long, this must be attended with dangerous consequences, the lower part of a limb becoming engorged from the stoppage to the returning blood, and gangrene speedily follows. This must inevitably be the result, when compression is made upon the whole circumference of a limb. Ring tourniquets have been contrived and employed to obviate this danger and difficulty; they are not very useful or applicable. In fact, partial pressure, even by the most clever and ingeniously contrived apparatus, cannot be endured for any long continuance. Pressure on the bleeding point is alone to be trusted to, as an effectual means of staying the effusion of blood. The cavity and surface is first of all to be cleared of coagulum and all foreign matter. The smallest bit of coagulated blood will interfere with the accurate adaptation of the compresses, and will encourage the effusion, as much as would a bit of sponge steeped in hot water. The mode of effecting the compression will be spoken of in Chapter VI.

In the modern and more approved practice of surgery, cauteries are seldom, if ever, had recourse to for arresting hæmorrhage. The proceeding is appalling, cruel, and not much to be trusted to. Caustics are also, in a great measure, dispensed with. For many purposes they are to be preferred to, and are equally efficient as, the hot iron, or other fiery application—as for the insertion of issues, the destruction of unsound cellular tissue, the removal of skin which covers or surrounds chronic abscesses or weak ulcers, for the destruction of the edges of sores of an intractable nature, or the cysts of tumours. The division of parts is occasionally to be effected with propriety and safety only by the employment of ligatures. Sinous tracks at one time were so laid

open, and many good surgeons, as Desault, pursued this plan in fistula in ano. I have, in some few cases, followed the practice with advantage in abscess of a chronic kind, by the side of the bowel, and in cases when the patient was alarmed at, and averse to the employment of cutting instruments. Some tumours can only be attacked with safety by means of ligature; tumours in the canals, opening upon the surface, may be so placed, that though not endued with excessive vascularity, bleeding from a cut surface, for their removal, can be stayed with great difficulty. The blood drains away for a time without notice, and accumulates in clots, so as to encourage a dangerous or even a fatal effusion of the vital fluid: again, tumours presenting on the external surface are often furnished so freely by vessels of a large size, and are, as it were, made up so much of interlacements of vascular tissue, the circulation in the immediate neighbourhood, besides, is so exceedingly energetic, that incision cannot be attempted without the greatest risk. In fact, from ill-advised and ill-conducted proceedings of the kind, lives have often been sacrificed and patients have even bled to death on the table before the eyes of the operator. Some vascular growths must be included together with their coverings; such may be thin and adherent, or may be involved in the action, may be pervaded also by abnormal erectile tissue. Other morbid masses may be more securely tied, and more quickly strangulated, with much less suffering to the patient, and much less consequent deformity, by first uncovering the growth, and detaching it from the surrounding parts. Flaps being made of sufficient size and proper form, the ligatures can be inserted and tied, as represented in the sketches illustrative of the subject in Chapter IX.

CHAPTER II.

ON THE UNION OF WOUNDS.

It must at once appear of the utmost consequence to every one who reflects upon the subject, that solutions of continuity should be so managed, as that, with few exceptions, they may be repaired, in as short a period as possible. The greater number of wounds, produced accidentally, are so circumstanced, that they can only be united by the second intention. They may indeed bleed freely, and their edges may look clean and smooth, but they are almost always attended by more or less bruising; a great deal of force having been generally applied in inflicting them. But however smooth and neat the incision may appear, the direction in which it has been made will, in all probability, more or less preclude the chance of immediate and speedy union. If a surgeon has the choice, as he very frequently has, as regards the form and extent of his division of the soft parts, he is very much to blame indeed if he does not manage his proceedings, so that the edges shall come together without any pulling, stretching, or undue pressure on the surrounding tissues. The period most favourable for, and at which immediate union of a wound takes place, the situation also in which it does so, most readily and certainly, ought to be well considered and understood by every medical practitioner. So long as oozing of blood continues, no purpose can in general be answered by pulling the divided surfaces into close contact. If this practice be pursued—if the parts be tightly drawn together, plastered, bandaged, and huddled up, the blood which oozes away from the smaller vessels is necessarily prevented from escaping. The consequence must be infiltra-

tion of the thin and loose open cellular tissue around, the distension of the cavity of the wound, and the separation of the surfaces, certainly of the deep-seated parts and very probably of the whole. There must ensue a congested state of the surrounding vessels, perhaps a troublesome hæmorrhage from branches that would otherwise have become sealed up; at all events a great deal of constitutional disturbance, a heated, swollen state of the injured part, a profuse bloody and putrid discharge must ensue, and this will be certainly followed by wasting suppuration from a foul cavity which will be long in taking on a healthy action.

A sort of routine practice has been long pursued in dressing wounds. They are put together without delay, and their edges squeezed into apposition and retained so, by various means, such as sutures, plasters, compresses, and bandages. They are carefully covered up and concealed from our view for a certain number of days. Then the envelopes of cotton and flannel, the compress cloths, the pledgets of healing ointment and plasters are taken away, loaded with putrid exhalations and a profusion of bloody, ill-digested, fœtid matter. A basin is forthwith held under the injured part, and the exposed and tender surface is deluged with water from a sponge, and then well squeezed and wiped. Then comes a re-application of retentive bandage, of the plaster, of the grease mixed with drying powder, and surmounted by some absorbent stuff, as charpie or tow, to soak up the discharge. This is not unaccompanied with pain, often more complained of than that attendant upon the original injury or operation. This process is repeated day after day, the patient is kept in a state of constant excitement, and often falls a victim to the practice, worn out by suffering, discharge, and hectic fever. It would here serve no purpose to detail the mode of cutting the plasters, and of spreading the pledgets; nor would there be any use in giving an opinion as to whether a mixture of the earth called armenian bole, or the impure oxyde of zinc, the tutty or calamine, was the best ingredient to put into the digestive, drying, healing unguents, or as to whether they should be compounded of one kind of animal fat and vegetable oil, or another; nor would any good come of stating

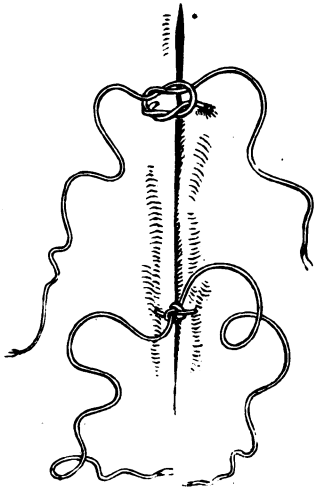
how the soiled bandages and filthy straps are to be removed, whether they are to be cut off or removed first from one end and then from the other. The system is a bad one, the applications filthy and abominable; the whole proceeding outrages nature and common sense. The wound is put in a forcing-bed, as it were; excited action, beyond what is required, is hurried on, and the consequence is, that union seldom, if ever, can or does take place. A suppurating surface, on the contrary, with profuse discharge, and a very tedious cure, if any, is obtained.

Surfaces are not disposed to unite for many hours after the division and separation has occurred. So long as oozing continues, there is no good end to be achieved by their close apposition. It is only when reaction has occurred, when the vascular excitement around the solution of continuity has taken place, and the circulation has been roused, when plastic matter begins to be secreted and thrown out, that the process can be expected to commence. The edges of a large wound, as that resulting from amputation of the extremities, may be approximated in part so soon as the bleeding from the principal vessels and larger branches has been arrested. But the close apposition, and the application of all the retentive means, had better be delayed for six or eight hours, at least. In the interval, extreme sensibility of the injured parts may be abated, the oozing moderated, and the chance of secondary hæmorrhage much diminished, by covering the parts with lint, dipped in cold water, and frequently renewed. This practice is the best that can be resorted to, as also in accidental wounds, those of the incised kind, that are fresh, and bleed freely. In these last, after hæmorrhage has entirely ceased, applications of an agreeable warmth should be substituted, such as poultice of bread and water, or what is much to be preferred for its simplicity, lint of thick texture, and of sufficient size to cover the wound, soaked in tepid water, and that overlaid with an ample piece of oiled silk, to prevent evaporation. Heat and moisture, by which qualities a poultice produces its soothing and beneficial effects, by which the surface is relaxed, its capillary circulation encouraged, and discharge promoted, are thus amply afforded, without any of the weight, putrefactive fermentation, stench, and

filth, which is inseparable even from the best and most scientifically contrived epithems and cataplasms; of course the approximating such wounds is effected, as much as possible, by position, and by the same means the return of blood is favoured, and engorgement of the vessels and inflammatory swelling prevented in a very great degree. The lower limb, if implicated, should be well raised above the level of the body, when in the recumbent position, on pillows, or on an inclined plane, properly stuffed, and the upper extremity is also to be kept similarly elevated. If the patient is in the erect position, it is placed in a favourable position in a sling. If the wound runs across the fibres of the skin and muscles underneath, these are to be relaxed by flexion, or extension, as may be, of the neighbouring articulations. Rest of injured parts is also essential, and this may sometimes be secured by the application of splints, of one kind or another. This therapeutic measure will come to be discussed and insisted upon particularly, in the chapters on injuries and diseases of bones and joints. As the solution of continuity is filled up, the edges are approximated, and during the cicatrization the same means must be persevered in, in order to promote the process. Support may be given in some stages of the cure by bandage, and occasionally by plasters; care must however be taken that this is not partial. It is seldom, indeed, that any good is seen to arise out of the drawing together by plasters of the edges of a recent solution of continuity, during the process of granulation and cicatrization. The contraction of the part takes place naturally, and generally with sufficient rapidity. It is often retarded by the means which are foolishly employed to hurry it on. The granulations are absorbed, the surface of the sore becomes foul, the discharge thin and offensive, and if the plan is persevered in, inflammation of the surrounding skin will follow, with extension of the sore by ulcerative absorption. In the treatment of wounds made in the various surgical operations, much will depend, as regards the course to be followed, upon the care that has been taken to give them a proper and favourable direction, and to preserve, as in extirpations and amputations, the due proportion of the different tissues to each other.

When the coverings have been smoothly and cleverly cut, and in the direction of the fibres, when there is an abundance of these as regards the deeper parts, then, after the surface has become glazed, (the vessels having been tied, and the cold water assiduously applied for some hours,) the surrounding skin previously shaved, is made thoroughly dry; coagula are removed, the edges are put carefully and neatly into contact, and retained by narrow slips of adhesive plaster placed at intervals; that commonly used is not well suited for the purpose; it does not retain its hold sufficiently long; it is loosened by discharge, it heats the surface, and often gives rise to erythema. For many years a better sort of plaster has been used by me and some of my colleagues very successfully in the Royal Infirmary of Edinburgh, and in the North London Hospital, as well as in private practice. It is composed of a solution of isinglass in spirit, and may be spread for use as occasion requires, on slips of oiled silk; on silk glazed on one side only, and on the unglazed side. This plaster can now be had, ready for use, prepared by Messrs. Fisher and Toller, Conduit Street. It is cut into strips of the desired breadth, and the adhesive matter dissolved immediately before it is employed by the application of a hot moist sponge. This composition becomes sufficiently adherent; it keeps its hold often to the end of the cure, and it is quite unirritating. Being transparent, the plaster does not prevent any untoward process that may be going on underneath from being observed, and if any fluid collects, an opening can be snipped for its escape. If, as often may be deemed necessary, a few points of suture have been made, these can be removed by cutting the thread shortly after the fixing of the plasters, and within twenty-four hours. No other dressing need be employed in the first instance, no compress, no pledget, no bandage. These applications may give rise to unpleasant effects, they are not wanted and do no good, in no way promoting the object in view, viz. the union of the wound and the cure of the patient at the end of eight or ten days. A roller may be applied in a few days after some amputations, in order to promote the subsidence of any slight œdema that may have arisen, and to bring the stump into a nice form. At an earlier period, the use of any

dressing whatever is productive of pain; it heats the part, and encourages discharge of blood and formation of matter. The discharge that does take place in the light and simple mode of managing wounds here recommended, is wiped from the surrounding skin, as it flows out, and from the taffeta or glazed cloth, on which the part lies. A great deal of suffering is thus saved to the patient, and he enjoys much comfort and cleanliness; a load of most unpleasant and harassing duty is besides taken off the surgeon's hands. The suture employed to adjust and keep together the edges of a wound during the first period, whilst the cold water is applied, and until the adhesive plasters have become firm, should be of the interrupted kind. The thread of waxed stay-silk, thick or thin, according to the size of the wound and the degree of retraction, is introduced by means of a sharp needle, well set, and in good order. The needle most manageable, and most generally applicable, should be curved only slightly towards the point. This form of instrument is preferable to the old curved surgical needle, excepting in some few cases, as in making suture of the alæ of the nose to the cheek, which may be required after some of the operations on the upper jaw or the rhinoplastic.

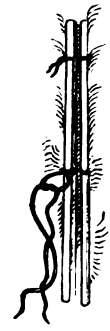


The interrupted suture is here represented. The needle is carried through the skin only on one side from the surface, and on the other towards it. The distance betwixt the stitches must depend on circumstances; of course the fewer inserted the better, seeing that the proceeding is uncommonly painful, and often more complained of, than the severe and extensive precedent incisions. The points of suture had better be taken out early, although in many instances, and when the parts are not on the stretch, they do not produce much excitement. A case occurred to me lately in

private, where amputation of the thigh was necessary. The patient had fully made up his mind to bear this, and he did so most heroically; but he would not suffer me to approach him within arm's length for any purpose afterwards. He screamed, and almost fell into convulsions, when I attempted, on the day succeeding the amputation, to snip one of the sutures. He suffered no inconvenience from their presence, and cut them across himself at the end of ten or fourteen days, with scarcely enough of discharge surrounding them to permit their easy withdrawal. Their presence caused him no uneasiness, and there was no excitement of the parts around the thigh at any period.

Under some circumstances, and in some instances, the rule laid down as to the propriety of delay in putting together the surfaces of wounds, and closing them permanently, may, with great advantage, be departed from, as when the entire surface can be brought into close and accurate apposition, so that no clot of blood can by any possibility be interposed. As for instance, in penetrating wounds of the mouth, or in divisions of the lip, made for any purpose, and in some deficiencies, natural or accidental, of the genital organs in either sex, where the surfaces can be intimately joined, by means of suture only. In some such cases the twisted suture is preferred, in others the quilled may answer, as in fissure of the perineum of the female. Whichever is used, and, in fact, whenever immediate union is desirable, so as to prevent deformity as far as possible, no dressing should be applied: the practice generally is to put on strips of plaster, or to cover over the part with a piece of lint, smeared with healing ointment, as some choose to call it, or to interpose dossils of lint betwixt the ends of the pins and the skin, and to support the parts, and take off the strain, as is said, from the suture, by a uniting bandage. All this is mischievous, and a remnant of the old meddlesome surgery. Any kind of application collects and retains the secretions, promotes discharge, heats and excoriates the surface, and naturally interferes with the process of union. The twisted suture, sutura circumvoluta, will be represented and explained in Chapter XV.; the quilled

suture is here shown. A few double ligatures are drawn through by means of a small single one, and in the loop of these a piece of bougie or quill is laid. Or the double ligature may at once be passed; the loop is cut so as to disengage the needle; the ends, on one side, are then knotted over the quill, and the other ends being drawn tight, are secured on the opposite side over another quill. Thus the deeper parts are brought into contact, and union, it is thought, more effectually provided for in some instances. In tying all silk or thread ligatures, what is called the reef-knot, difficult to describe, but well represented in the plan, p. 32, and in others throughout this work, is used. Ligatures of wire, (a composition of platina, &c.,) possessing great ductility and strength, have been used in some situations. They are introduced by means of a short needle, with a female screw in one end, held in forceps, or in a porte-aiguille; the parts are approximated, and retained in contact, by carefully twisting the ends.



The propriety and necessity of strict attention to the general health of a patient, who has suffered from injury, or has been the subject of a surgical operation, of constant observance of the state of the circulation, of the condition of the stomach and bowels, of the skin and kidneys, and their different secretions, cannot be too strongly impressed upon the young medical practitioner. If these circumstances are overlooked, if the constitutional treatment is neglected and slurred over, nothing can go well, the best and most brilliant manipulations will be thrown away; and however much the disturbance of the system may be arrested, or calmed, by the prevention or removal of local irritations, this will assuredly go for nothing, if the functions of the internal viscera are permitted to become deranged. An observant surgeon will detect the presence of constitutional disturbance long before the state of the pulse, or tongue, or of the secretions and dejections indicate any mischief, by the condition of an exposed

surface. By the colour of granulations, the appearance of the edges of a sore, the character and quality of the discharge, he is put upon his guard, and is able to meet the coming storm, to arrest much general and local disturbance. A surgeon, moreover, must look, more especially in some states of the atmosphere, to the ventilation and warmth of the apartments in which his patients are placed; he must take care, in hospital practice, that there are not too many individuals lodged in the same apartment. He must prohibit the sponging of sores, and scrubbing away the matter that is poured out upon them for the protection of the granulations; he must separate those labouring under erysipelas from such as are unaffected; and he must be careful not to check discharge from sores suddenly, or to irritate their surfaces, and the integuments surrounding them.

CHAPTER III.

ON INJURIES OF BONES.

INJURIES of the osseous tissue are generally produced by the application of a considerable degree of force; and if this has been made directly to the part that has suffered, the soft parts must of necessity be more or less contused. Even when the continuity of a bone has been destroyed by force applied at a distance, to its extremity for instance, and in the direction of the shaft—if any displacement has arisen in consequence, the deeper seated muscular and cellular tissues must be torn to some extent. Effusion of blood will ensue, the capillary vessels, bruised and deprived of their contractility, will speedily become gorged, red blood will be admitted into those branches which previously carried only colourless fluid; an ecchymosis of greater or of smaller extent, according to the degree of laceration, and the size of the branches implicated, must be the consequence. The injuries of some bones must be considered also in reference to the organs which they contain, and which they are intended to protect. These are often affected in a serious manner, their functions are suspended for a time, or they may be entirely destroyed.

The process of reparation takes place in a different manner in some bones from what it does in others—in some the process is completed readily and rapidly, in others much more slowly. Some bones are repaired only by membranes, if there is any considerable loss of substance; others are united by ligamentous matter under many circumstances; and again, fracture in some situations is united almost uniformly by cartilage only. The rapidity and perfection of union will greatly depend upon the degree of

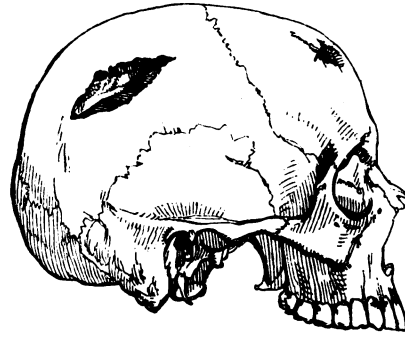
lesion, and upon the mode in which the treatment has been conducted. The injuries of the flat bones may first be considered, as perhaps the most dangerous in their consequences, and the most difficult to treat; the most important, on these accounts, for the practitioner to understand thoroughly. This remark applies, at all events, to the fractures of the bones entering into the formation of the cranium, and of the pelvis.

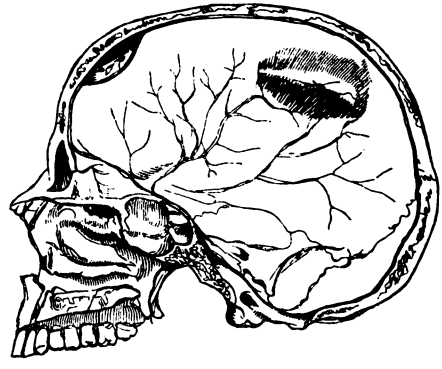
FRACTURES OF THE CRANIUM.

The cranial bones, in the young subject, bear a considerable degree of pressure without breaking: like other young bones, they may be considerably changed in form, without solution of continuity, to any extent, occurring. The displaced portion will sometimes again return to its original level; but, after adult age, and more especially in those advanced in life, fracture of one or both tables is readily occasioned. The fracture, at any particular point, may be the result of force there applied; or the part struck may remain entire, and on that opposite or where the resistance has occurred, as, when the head has been driven down upon the top of the spine by a blow on the vertex, a breaking up and splitting of the bones may be found to have occurred. This fracture of the basis cranii has been otherwise accounted for. It has been said, and perhaps truly, that when pressure is made upon the crown of the arch formed by the parietal bones, that, by their expansion, the bones which bind or tie them together, the temporal and sphenoid, are apt to be torn asunder and split. Very little can be done to remove the bad effects of such lesions; the injury is often so extensive, there is such laceration of the vessels, even of the large venous sinuses, that blood is effused in quantity, and exerts upon the most vital part of the nervous system prejudicial and fatal pressure. The termination is not long delayed, in the majority of instances. In other cases, where, from the symptoms and the signs, bleeding from the cavities connected with the bones of the base, and purulent discharge for a time afterwards, (though these are by no means unequivocal signs of such injury,) there is good reason to

suppose that fracture has occurred, the patient lingers on, and may ultimately be restored to health. The surgeon can interfere only to avert or moderate inflammation, if it should occur.

Fractures of the upper and more exposed parts of the cranial bones may involve a great portion of one or more of them, though there may be no displacement; or a great part of both tables may be driven under their proper level; or, again, the external opening in the bone may be small and the internal table may be very extensively detached in splinters, as exhibited on the anterior fracture in the two sketches annexed.





In the former case, the fracture may be simple or compound: in the latter, it is almost always compound and comminuted, in consequence of the peculiarly brittle nature of the inner layer. The fracture with extensive depression is generally the result of a blow by an obtuse body, or of a fall upon some smooth, hard sub-

stance, of considerable surface—the external parts may be divided or not. But the punctured fracture, on the other hand, is occasioned by the application of a sharp or pointed body with considerable force; this can scarcely occur in such a way as to affect the bones without previous division of the common integument and other coverings, probably of the dura mater also. The comparative danger does not arise from the circumstance of the fracture being attended by a wound or not, but in consequence of the effect upon the internal table and contained parts.

A large portion of bone may be driven down, without any permanent disturbance of the functions of the brain; the patient may be stunned, and may suffer from the effects of the shock for some time, as he may and often does, without any lesion of bone or other part, and gradually recover; or, on the other hand, he may be affected by deep and continued stupor, which can only be relieved by the replacement of the depressed bone, by raising it to its proper level. The insensibility consequent upon commotion of the cerebral mass and disturbance of its circulating system must be carefully distinguished from the symptoms of compression of the organ; the first is always the immediate result of injury. Its duration varies from a few minutes to many hours or days. The general circulation is low and weak, the surface cold, the respiration, though difficult, rarely stertorous. The patient sometimes empties the stomach of its contents; he has a rigor, and this is generally the precursor of reaction. The circulation is gradually restored, if means, which are calculated to prevent reaction, such as early venesection, are not resorted to, and which often enough lead to extinction of the vital functions. The stupor in concussion is rarely complete. The patient can be roused, answers hurriedly and impatiently, in monosyllables: the circulation is irritable, and by motion of the body may be increased remarkably in rapidity. The pupils are generally contracted, sometimes one is so affected, the other dilated; at first they are insensible to the stimulus of light, often enough, however, this may arise from more or less compression of some part of the brain, as by effused blood. In many cases of what is looked

upon merely as concussion, the base of the skull has suffered considerably; blood lies on some part of the brain, its substance may be torn, and the symptoms and signs are thus mingled and confused:—the muscles are sometimes relaxed, at other times rigidly contracted and convulsed; as the case proceeds, the symptoms change their character, those indicating inflammatory action are apt to supervene, such as rapid, sharp pulse, signs of violent suffering in the head and delirium.

Compression of the brain, again, whether occasioned by effusion of a quantity of blood upon the organ, or in its substance, comes on after the lapse of some time. The patient is stunned from the first, but, after a few hours, he falls into a state of greater stupor or deep coma. He may recover almost entirely from the immediate effects of the shock and stunning; he may become warm, the circulation may be restored, and his sensibility return; but this is shortly succeeded by insensibility. In cases where the brain is at once compressed, and a portion of its substance displaced, with or without wound, perfect insensibility exists from the first. The patient cannot be roused, his pulse, after reaction has occurred, is slow, as is the breathing; the limbs are supple, the pupils dilated and fixed, the sphincters relaxed. These symptoms occasionally, though rarely, abate; generally they continue unabated, and if means cannot be devised to remove the pressure, the patient sinks. His dissolution may take place without much change in the symptoms, or there may ensue an inflammatory attack, followed by additional effusion.

Extravasion of blood often takes place to a great extent, and at an early period after the injury, as when a vessel of large size is torn; the exact situation of the extravasion is with difficulty ascertained; and if it is, and is situated so as to be reached with any degree of safety, it cannot be removed; surgical interference, at all events, in the way of operative procedure, offers but little prospect of benefit to the patient. The practice has been advocated, and I have even seen it resorted to, but with no encouraging result. The upper part of the brain often bears, from the first,

a great deal of pressure with impunity, or it becomes accustomed to it, and the symptoms gradually abate; the patient recovering with a great portion of bone completely under its natural level. This was the case in the camerated fracture of the parietal bone, as it has been called, an external and internal view of which is given at page 38. The patient, after a great many weeks, perished solely from the effects of a fracture of the sacrum. Patients have had extensive depression, with wound of the brain and membranes, large portions of the organ have been discharged, symptoms of compressed brain have existed for some time, and ultimately, without any interference with the bone, the symptoms have abated, and a complete recovery has ensued. If the stupor is intense, and no signs of amendment appear, in cases where a portion of both tables of the cranium is driven down upon the contained parts, then the surgeon will act wisely in relieving the brain without delay from this prejudicial and dangerous pressure.

The nature of punctured fractures (radiated and star-like, as they are denominated) has already been noticed; the presence of the numerous sharp spiculæ of the internal table, for even a short period, upon the surface of the dura mater, (and the more so if any of them have penetrated,) is almost uniformly followed by intense inflammatory action, propagated to the brain and its more immediate investments. At all events, if the patient escape this danger, he is apt to suffer, at a later period, from abscess under the bone, occasioned and kept up by the dead portions. The internal table is sometimes only partially detached in young subjects, and bent down, as it were, on the membrane. These cases demand interference, either immediately upon the occurrence of the injury, even though the symptoms of oppressed brain or disturbance of its functions do not exist, or at a later period, for the evacuation of matter, and the removal of the cause of the abscess. The following case may be given in illustration.

Case.—"H. N., aged eleven, was admitted into the North London Hospital on September 16th, under the care of Mr. Liston. Eleven weeks since, while riding in a cart laden with

ginger-beer, the vehicle was upset, and the boy received two wounds in the head, from the broken fragments of the stone bottles. One wound was situated on the posterior, the other on the anterior and superior part of the head. The posterior wound was an incised one. It is now healed. The anterior was a punctured wound, from which was taken an angular piece of bottle, and it still continues to discharge matter. He was insensible for one week after the accident, from which state he recovered by degrees, so that at the end of a month he was able to walk about; but, a few weeks afterwards, he lost the power of speech for three days, which he recovered on a profuse discharge of matter taking place from the wound. He has had several attacks of insensibility, their duration varying from two or three to twenty-four hours.

"Mr. Liston examined the anterior wound with a probe, which could be passed nearly an inch and a half into the wound, somewhat in a perpendicular direction, showing that an opening existed in the bone. He was of opinion that some portion of the bone was depressed, or that the inner table was fractured, and perhaps loose on the dura mater, which was the cause of the profuse flow of pus, and of the symptoms above detailed.

"On the 19th, Mr. Liston proceeded to use the trephine. The anterior part of the head having been shaved, he made a V-shaped incision, including the opening already existing, the apex of the flap being towards the nose. The flap being dissected back, a fissure was discovered, about an inch in length, extending from the original wound towards the apex of the flap. The fissure was filled up with membrane, except at one point, where an opening existed, with some little depression of bone. A small trephine was then applied on one side of the fissure, near the opening, and a piece of bone removed. An angular piece of the inner table, projecting much inwards, was found attached to the circular piece. On the opposite side of the fissure was observed a similar depression of the inner table, which was also removed

by the trephine. Some small spiculæ were picked out from the surface of the dura mater with the dissecting-forceps, the flap was then laid down, and retained on each side by sutures, the apex being left free. Lint, dipped in cold water, was applied over the wound, and he was ordered to be placed in bed, with the head elevated, and to be kept quiet. Cold water to be applied every quarter of an hour, until all oozing of blood has ceased.

"Seven hours after the operation, the blood ceased to ooze. Two strips of isinglass plaster were then applied on each side the flap, leaving the apex free, to allow of the ready escape of any secretion. The stitches were removed, and warm water dressing was applied to the points which were uncovered by the plaster.

"Nine o'clock, P. M. Has had some pain in the head; pulse 101; skin rather hot and dry; feels disposed to sleep. To have a saline purgative, with tartarized antimony, every four hours.

"20. Slept well until late this morning, when he became rather restless, and vomited several times. No pain in the head; tongue dry; pulse 108, small; bowels not open. To discontinue the antimonial medicine, and to have a purgative enema.—*Vespere.* Bowels freely moved by the injection; the sickness has ceased; pulse 120, fuller; skin moist; no pain in the head; tongue cleaner; low diet. Everything went on favourably afterwards, and he left the hospital well on the 4th of October."—*Lancet*, Oct. 1836.

Abscess occasionally forms betwixt the dura mater and bone as a consequence of contusion. The symptoms, of course, do not appear for some time after the injury. The patient becomes feverish; his rest is disturbed; he complains of tightness, and pain in the head and back of his neck. Rigors, followed by flushings, and sometimes by convulsions, supervene. Signs appear externally, in some cases, indicating the mischief going on underneath, and the site of the collection. Œdema of the scalp, if it has not been divided to any considerable extent, appears, along with that peculiar soft, boggy feel, which conveys through an experienced finger a conviction of the existence of purulent matter, at some point, although perhaps in small quantity. If the scalp has been divided, the edges of the sore become swollen, the dis-

charge is suppressed for a time, then becomes thin and gleety. The pericranium separates, and the exposed bone shows every sign of lost vitality. It is pale or ash-coloured, and bloodless. If at this period the dura mater is exposed, the probability is, that a small quantity of thick and adherent matter will be found on a detached and discoloured surface. A perforation may probably be found to exist, leading from this depot to the surface of the arachnoid or perhaps into one of the sinuses. Some of the signs of abscess may exist without others, as death of bone to some extent of surface and thickness, and without the symptoms above detailed having preceded. An opening may, and has sometimes been made in such cases, and the dura mater has been found firmly adherent. The surgeon will sometimes be deceived, not as to the existence of abscess, but as to its site, and he may fail of reaching the collection and giving relief; as when matter has formed on the surface of the pia mater, or in the cerebral substance, in which case the symptoms are occasionally less urgent; for the constitutional disturbance is often not so great as when the accumulation, even to a small extent, occurs immediately under the bone.

For the purpose of raising depressed portions of both tables of the cranium, which give rise to continued and deep coma; for the removal of foreign bodies; with the view of taking away spiculæ of the internal table, which by their presence are almost certain to occasion dangerous inflammation; or lastly, in order to reach and evacuate matter, which may, from the rational symptoms and sensible signs, be supposed to exist under the cranium —the surgeon will occasionally be called upon to expose part of the bone, and make one or two perforations through it. The general and constitutional treatment of injuries of the head, and their consequences, is now much better understood than formerly. The danger of still farther widening any breach in the bone, exposing the membranes of the brain, and leaving them without their due and accustomed support, is now fully appreciated. Operations are accordingly now seldom resorted to primarily without the most urgent and pressing necessity; and again, secondary symptoms are less frequently permitted to arise or gain ground. Trepanning of the skull consequently, which with our

forefathers appears to have been an every-day occupation, is an operation, at this period, very rarely resorted to or witnessed.

The instruments proper and essential for exposing and dividing the cranium for any of the ends above noticed, are a strong, sharp-pointed bistoury, a large and small trephine, (those fluted so far outside are to be preferred, being more readily inclined, in order to divide bone of unequal thickness safely,) an elevator, and Hey's saw, with straight-edged blades. The trepan is now almost entirely disused; it can be employed safely enough, and the perforations are perhaps made a little more quickly; but this is no great object. The division of bone is not attended with pain, the patient is almost perfectly insensible, or, on the other hand, the portion of bone operated on is dead, and it is not now customary to make a dozen or twenty perforations at a sitting, as some of the old surgeons did along a fissure, or in search of extravasated blood. A few minutes, more or less, spent in perforating gradually and safely, are not to be considered as time thrown away. The raspatory and lenticular, still added by the instrument maker to swell out the case, are, or should not be employed, the one is intended to denude the bone; this should be done but to a small extent, only to permit the application of the crown of the trephine, and can be effected by the point of the knife and dissecting forceps; the other was used to smooth the edge of the opening, but it cannot be used without unnecessarily detaching the dura mater. Any sharp spine in the opening can be easily removed by the careful employment of the elevator.

In operating on cases of fracture with depression, the injured part must be exposed by dividing the scalp. The direction and extent of the incisions will depend upon the nature of the injury which the bone has sustained, and upon the state of its coverings. If the scalp be not wounded, the bone may be exposed to a sufficient extent to show the depression by two incisions, the one falling at right angles upon the other, the flaps being turned back. The longer incision should be made in the direction of the fibres of the occipito frontalis, and formed at once by carrying the point of the knife down to the bone, and drawing the instrument along

so as to divide all the layers at once. Some care may be required, in cutting over that part of the bone which is broken, and the knife must not be carried so deeply as to endanger the parts beneath, but he must be a very incautious person indeed to whom such an accident could happen. The injured portion of cranium may be exposed by a corresponding accidental division of the scalp, or a slight extension of the openings may suffice to afford a proper view and facility for the after proceedings. If one or more small openings exist, the form and direction of the incisions ought to be varied so as to include them. To expose a puncture of the skull, one flap will often be sufficient, the corresponding opening in the scalp being left untouched in the middle of the raised portion; or an incision may be carried a little on one side of the opening, and another made through it, so as to fall upon the first. Two flaps are thus formed and raised, bringing fully into view the perforation, and admitting of its enlargement. This form of incision is to be preferred, the apex being dependent; and the same will be found to answer very well for opening the puffy swelling and collection over any piece of bone, which it may be considered necessary to remove, in order to evacuate an abscess upon the dura mater. If, in such a case, there is a wound, it may be included in the incisions, or raised, in the flap, if small.

Some depressions may be raised without any removal or even division of bone, by a careful use of the elevator. This instrument should be of the most simple kind, one end a little smaller than the other, and a little rounded off. The point of this instrument, when the fissure is wide, may be insinuated under the depressed portion of bone; and by making a fulcrum of that which is sound, the object of raising it to the natural level may be achieved. A small portion of detached bone may be picked out, to make room; or again, the fissure may be widened by the judicious employment of the small straight cranial saw, so as to admit the elevator. This saw can only cut in a straight line to any depth. The convex-edged blades, which are said to be useful in making curvilinear sections, are utterly useless. A

groove may be made swerving from a straight direction, by one of these tools, constructed for sale and not for use, but it will puzzle the most dexterous mechanic to do more, to cut with them even to the depth of a line, and to any extent.

In order to gain space for the disentanglement of the depressed bone, and for the efficient application of the elevator, it is in many cases necessary to remove a circular piece of bone. This is generally done so as to attain the desired object most readily as near as possible to the point where the force has been applied. In very bad and extensive fractures, large portions may be found entirely detached and loose, but very frequently the depressed portion is not separated: on one side the bone is cracked and bent down; that part which has been struck is generally driven more deeply towards the cavity, and is wedged under the sound portion. By removing part of this, the elevator can be introduced with advantage under the depressed piece. The crown of the trephine is therefore applied so as to overlap slightly the injured part, and to remove the broken edge. The centre pin extruded and fixed by a turn of the thumb-screw can, if properly shaped, be made, by a few turns, to penetrate and bring the teeth of the saw into contact with the bone. Then, by holding the instrument lightly in the hand, and pressing only in turning it from left to right, an impression will soon be effected. When it has penetrated little more than a line, and the crown is sufficiently steady, the perforating centre-pin is withdrawn: the proceeding is then gone on with, the depth of the perforation is measured by the flat end of a probe or tooth-pick, and the more carefully as the saw advances, the bloody detritus being wiped away from time to time. When the internal table is approached (and this may sometimes be guessed at by the facility with which the instrument moves, by the change of sound, and the greater quantity of bloody stuff which oozes out by the side of the trepan,) at all events, after proceeding to a certain depth, greater caution must be observed. The thinness of the bones in young subjects, and in many old ones also, together with their extreme density, must not be overlooked; more frequent probing must be made, the instrument used with scarcely any pressure,

and inclined accordingly as the division is found to be completed, or nearly so, at different points. The circle being loosened, it is easily removed by the point of the elevator. In some cases a second perforation may be found to be absolutely necessary before matters can be put into a satisfactory train. When the trepan is applied for other ends, one perforation will in general be sufficient, and it must be made with the same prudent precautions as here inculcated. In those parts of the cranium where the bones are known to be of very unequal thickness, and where the large venous sinuses traverse, of course still greater precaution must be observed.

After the perforation of the bone is completed, and the object for which it was undertaken accomplished, the flaps are to be replaced and retained by a point of suture, by a strip of plaster, or compress, according to circumstances; lint soaked in tepid water, with oiled silk over it, will generally be found the best dressing. In some cases it may be well to give some support to the membranes, as when a large portion of bone has been necessarily removed. This is effected by the application of a compress of lint, retained by bandage. Various split cloths, as they have been called, were at one time used, for the purpose of making pressure, on different parts of the cranium, and for retaining dressings; a handkerchief well applied, or a night-cap, will often answer perfectly. A double-headed roller may be turned round the head in such a way as to compress one part, or to give uniform support to the whole.

FRACTURE OF THE PELVIS.

This must always be looked upon as a serious injury. Many cases are almost necessarily fatal, and that within a very short period; others, again, are attended with very great danger to life, and all are more or less hazardous, and often troublesome, to manage. The risk attendant upon this injury is increased by lesion of the contained parts; the bladder is occasionally wounded by a portion of bone, or it may give way, if distended, from the same force that caused the solution of continuity in the bones. The urethra is also not unfrequently torn in the same way,

either by a fragment of bone, or by direct violence from without. The fracture is slow in being repaired, and if the portions are not preserved perfectly steady and immovable, extensive and deep-seated abscess, not unattended with danger to life, may be the result. Fracture of the pelvis is the consequence of great force applied directly, or through the medium of the head and neck of the thigh-bone by a fall from a great height, or from a violent crush by a heavy body falling upon this region, or passing over it. A person slips, for instance, from the rigging of a vessel, or from the top of a house in progress of building, through many floors, and alights on his fork: there ensues a fracture and diastasis of the bones of the pubes, probably with injury of the urethra. Or he is crushed by the falling of a mass of earth, or by a loaded waggon passing over the lower part of the trunk. The signs are, inability to use one or both limbs in progression, great pain in the region, and, perhaps, the evacuation of bloody urine, or a total stoppage to its flow. The signs will be found to vary, and the facility of detecting these fractures will depend upon their site and extent; sometimes we must depend upon rational signs only, it being often impossible to detect crepitation, or to ascertain displacement. The nature and degree of the force applied is considered; the patient is sensible of grating in the bones in moving the trunk or limbs, or in having them extended for the purpose of examination. The solution of continuity may exist in various parts of the bones; the crest of the ilium is sometimes broken off, the ossa pubes are broken close to the symphysis, or this may be separated without much fracture; the fissure may pass through the obturator foramen, the rami of the pubis and ischium being broken, and it may involve the acetabulum; if so, the corresponding limb is disabled, and it may probably be everted, in consequence of the bruising of the glutæi. Crepitation may often be detected whilst the limb is moved, by applying the hand, by means of the ear, or by passing the fingers into the bowel. Sometimes the sacrum suffers solution of continuity; it is broken transversely or longitudinally, and generally the fracture is comminuted. It is caused by the application of great

direct force; the fracture is not easily detected, and it is slow in uniting. Due attention must be given to the injuries of the viscera, as explained in Chap. XII. The catheter must be used frequently, or retained; incisions of the perineum may be required. The patient must be kept quiet, and in the recumbent position, and that for a considerable time, for many weeks, at least. A bandage may be applied, in the first instance, and, afterwards, a broad band is passed round the region, and fixed by buckles. If there be reason to suppose that the cotyloid cavity is implicated, the motion of the limb must be restrained. It is best kept steady by the application of the long splint, described and represented in treating of fractures of the thigh; but there is no occasion for tightening the perineal band so much, or even for its application at all, there being no shortening of the limb to counteract. Antiphlogistic means must, of course, be resorted to according to the nature and violence of the symptoms. If the patient is kept quiet, and the parts steadied and fixed from the first, these will hardly be called for.

Fractures of the sternum and scapula do not require any very peculiar treatment, and will be noticed under the head of Injuries of the chest, and of the upper extremity.

Fractures of the bones of the upper part of the face are not attended with much displacement. The ossa nasi are occasionally dislocated, with or without fracture; these injuries are produced by direct violence, and are generally compound; for if the skin is not wounded, the Schneiderian membrane is at all events so. There is profuse effusion of blood from the nares, and this is often followed by inflammatory swelling, and sometimes by abscess and destruction of the cartilages and bones. The parts are easily replaced by the introduction of a strong probe or closed forceps into the one and other cavity; an uncut quill will answer the purpose, if no other instrument is at hand. The bones are thus pressed into their places, and moulded by the fingers of the hand not otherwise employed; there is no great risk of their being again displaced. Inflammatory action may require to be moderated by general or local bleeding, pur-

gatives, and fomentation. Abscess of the septum, if it occurs, is opened early.

Fracture of the inferior maxilla is pretty frequently met with —the result of force applied directly to the part which has given way, or to some distant part of the bone. It may be struck at the symphysis, and yield on one or both sides near the angle; or the force may have been applied to one side, and the solution of continuity may be found to have taken place on the other, about the insertion of the canine or first molar tooth. This fracture is always attended with wound of the gums and lining membrane of the mouth, with loosening of the teeth, and loss of blood; there is often great splintering, and not unfrequently also wound of the integument. There is always more or less displacement: the shorter fragment being drawn towards the cavity of the mouth by the action of the mylohyoid and pterygoid muscles. It is also elevated by the temporal and masseter, the antagonists to which are cut off, as it were, from that side.

A good deal of difficulty is at first experienced in keeping the broken surfaces in immediate apposition; after swelling has taken place, the object is more readily attained. The treatment will be influenced a good deal by the state of the teeth, their presence or absence. If the teeth are much loosened with splintering of the sockets, it may be prudent to remove them. If they are firm in the neighbourhood, a small wire may be passed round them on each side, at some distance from the fracture, and by twisting it the parts are put straight; or a machine with blunt hooks and screws, to be had of the instrument makers, may be applied, or grooved, wedge-shaped pieces of cork or wood may be put along on each side between the teeth of the upper and lower jaw, and the base of it supported by a piece of pasteboard, cut so as to make a proper case for the part, when softened in hot water and dried upon it; this is retained by a double-headed roller, or split cloth, passed round the vertex and there secured.

INJURIES OF THE SPINAL COLUMN.

The immediate effects of concussion, and even of slight

fracture, and partial displacement, are sometimes recovered from; by judicious treatment, rest, and other antiphlogistic means, and by good luck, some few persons who have so suffered, are perfectly restored to health. The sensation and power of motion of parts supplied by nerves from below the injured part, return perfectly, though perhaps slowly, and no bad consequences ensue. In other cases, again, the immediate effects may, in a measure, disappear, but these are followed, sooner or later, by gradual loss of power and feeling in the lower parts of the body, of contractility in the bladder, want of sensation in the nates and extremity of the intestinal canal, formication, weakness, and awkward movement of the limbs. These symptoms indicate degeneration of the spinal chord, which sooner or later terminates in complete paraplegia. Fracture, with considerable displacement of parts, (and without solution of continuity luxation is rare,) is attended, as an immediate consequence, by paralysis, more or less complete, according to the site and extent of the injury. It is produced by great force, applied either directly or indirectly to the chain of bones. The spinal marrow is torn, or stretched, or pressed upon by portions of bone or by blood. Inflammation, and its consequences, may occur unless carefully guarded against; the period at which a fatal termination is likely to ensue, will of course depend much upon the part that is injured; the higher in the column the more urgent are the symptoms, and the more complete the paralytic state. Some injuries of the spine are very quickly fatal; but even when respiration is somewhat interfered with, life is prolonged for a short time. The treatment can only palliate; the motion of the injured parts is guarded against by position, and by the application of some sort of splint on either side of the spinous processes: the bladder is carefully attended to, and accumulation of urine, with its consequences, prevented. It has been proposed to make incisions on the broken bones to examine the extent of the fracture and displacement, and to attempt the removal of the pressure on the chord by trephining, by the application of pincers, &c. By these means, now generally and very properly looked upon as unwarrantable, effused blood could not

be removed, nor lacerations repaired, whilst the chance of inflammatory action would be much increased.

The fractures of the other short bones are not often met with unless accompanied by much laceration of soft parts, and frequently by wound. The structure and functions of the limbs are destroyed, and very frequently the best chance of recovery is given to the patient by amputation. Simple fractures of the bones of the tarsus and carpus are not attended with much displacement; their existence is often not readily ascertained after extensive bloody swelling has supervened. Perfect rest, elevated position, and antiphlogistic means are only required, as in sprain or bruise. When the two first indications are strictly fulfilled, nothing else but fomentation will be wanted. If inflammatory action is excited, it must be combated by efficient means, as local abstraction of blood. The use of cold and evaporating lotions is not indicated.

FRACTURES OF LONG BONES.

Solution of continuity, in the long bones, takes place in a transverse direction, obliquely or longitudinally, as regards the shaft; the bone is rarely split without being broken across, and the fissure generally extends through the epiphysis into the articulation. Fractures are, besides, otherwise complicated by great laceration of the soft parts—by extensive effusion of blood into the joints or intermuscular cellular tissue—by division of muscles, or wound of the integument. The existence of wound communicating with the fracture, or produced either from within or without, constitutes the compound variety. The nature of the fracture, and the degree of injury to the soft parts, will all depend upon the direction and intensity of the force which has been applied. Oblique fractures are generally the consequence of force applied in the direction of the axis of the bone; and when there are two bones, they often give way at different points, one low in the limb, the other near the upper articulating extremity. Transverse fractures may result from a blow on the part, from the action of the muscles, or from sudden motion of the upper part of a limb, whilst the lower is fixed and at rest. If the direct

violence is great, splintering of the bones is the result, with great bruising of the soft parts, followed by rapid and considerable swelling. Broken bones are always at first surrounded by a quantity of effused blood.

This, if matters are allowed to proceed favourably, is absorbed in the course of a few days, and the process of reparation is commenced. The intermuscular cellular tissue is often also loaded by effused blood. This latter often does not disappear completely for many weeks; lymph is effused, when the injury to the soft parts has been great, among the muscles, and even into their substance. Their fibre is changed in appearance: it becomes white, dense, and almost fibrocartilaginous, when the excited action has been intense, and when great inflammatory swelling has supervened. The functions of the muscles are suspended, and this tumour around the bones contributes much to steady them; gritty, earthy matter may sometimes be detected in the effusion amongst the muscles. When this takes place to any great extent, it is often traceable to some spicula of bone extruded from under the periosteum, which has contracted new attachments, and retained its vitality. Such fragments are often found at some distance from the fracture and adherent to fascia, muscle, or tendon. The periosteum, which is necessarily torn, becomes more vascular: it is thickened for some distance above and below the injured part—plastic matter is secreted, and becomes organized—the wound in the membrane is repaired—lymph continues to be poured out by the vessels of

the periosteum and bone; and their continuity is re-established by the ramification of branches through this organized mass.

The medullary cavity, to a certain extent above and below the solution, is also occupied by blood, and at a very early period by a similar secretion. Marrow and meditullium give place to a vascular and dense mass, in which spiculæ of new bone are soon discoverable: the cancellated texture disappears, and is filled up in the neighbourhood of the fracture.

Betwixt the ends of the bones, if well adapted, as they ought to be to each other, a gelatinous looking matter is also poured out. In the deposit under the periosteum, upon the surface of the shaft of the bones, and in the medullary cavity osseous matter is soon formed. A broad ring or ferule of new bone, as represented above, though to rather an exuberant extent, surrounds the broken extremities, and these are still more securely held together by the internal plug. The shell of the bone becomes condensed for some distance above and below the solution of continuity. The perfection of this temporary union may be looked for sooner or later, from the third to the eighth week, according to the age of the patient, and situation of the fracture, the degree of injury, and the care with which the treatment has been conducted. The deposit betwixt the ends of the bones is more slowly organized and ossified. Months often elapse before the union is so completed; when that is accomplished, the external deposit gradually disappears; that amongst the muscles has long before been absorbed and re-admits the free exercise of motion. The cancelli are again freed of the osseous matter which filled them, and the limb resumes very much its original and normal form and functions.

When the ends of broken bones are permitted to remain so far displaced, when they project amongst the muscles, and ride over

one another, there must of necessity be much greater excitement of the circulation in all the tissues, involving a much greater degree of bloody effusion, followed by more extensive inflammatory swelling, than occurs in the condition of parts already described. If the patient does not succumb from the effects of inflammatory swelling, (which is never to be contemplated or dreaded, if the local treatment be well conducted,)—if he escape the risk of gangrene or suppuration, a pretty rapid and firm union may ensue, but necessarily accompanied by deformity, distortion of the limb, shortening and lameness. A greatly excited state of the circulation of the periosteum and bone of long continuance, is the result of bad co-aptation and retention. An extraordinary effusion of lymph takes place, with great pain and swelling. The broken extremities soon become fixed permanently by the organization and ossification of the deposit, and by the adhesion of the opposed surfaces of the periosteum. This membrane disappears, and the portions of bone lying side by side, are consolidated; perhaps the consolidation may even be sooner effected thus than when the bones are placed straight, as nearly as possible in their natural position, with the broken surfaces in contact. The action is then slow and gradual; sometimes it appears to be almost under the mark, and barely sufficient to furnish an adequate uniting medium. The confinement is perhaps longer, or rather it may be said, the functions of the limb cannot be resumed altogether so quickly when the cure is properly conducted, and the limb is left quite handsome and straight, as when, on the contrary, the patient suffers much pain and fever, has the limb pulled about, the fracture continually interfered with, and is ultimately turned out of bed with a short and crooked extremity. The process of union in bones is effected in a similar way to that of the other tissues, it is modified, however, of course, by the degree of vascularity; the conversion of the organized lymph (which in all circumstances is the medium of union) into a substance similar to the original structure, is here not so rapid. The union may be delayed, or may ultimately fail to be effected by osseous matter, from a variety of circumstances, as from great and frequent loss, or determination of blood to other organs, from

profuse discharge of matter in the vicinity, as in bad complicated fracture, in cases where extensive abscesses form, or from bad management. The cure is sometimes interrupted by the frequent motion of the ends of the bone upon each other, in attempts to improve the appearance of the limb; or in consequence of the insufficiency of the retentive apparatus. The process of union in fractures complicated with wound, is in all respects the same as in the most simple, though generally more slow. The lesion of the periosteum may be prevented healing by the presence of splinters. Again, the action now and then flags in consequence of the discharge, and the consequent general and local debility.

The object of the surgeon in the treatment of all fractures, must be to obviate pain and suffering, to put the parts in the most favourable condition for being repaired, and to preserve the limb of its normal shape and length. All these indications are fulfilled by the same means, viz. instant co-aptation, and retention of the broken ends in the most perfect possible apposition. The earlier the means are adopted, the greater and more immediate will be the patient's relief from suffering, and the less the surgeon's anxiety and labour; excess of bloody and serous effusion will thus also be prevented, and the excited action kept within bounds. Prevention, it is admitted, is always better than cure; and if the above recommendation is attended to, all necessity for local abstraction of blood, and for the use of lotions, to cool the part, will be obviated. If, on the contrary, the limb is laid in an easy position, as it is thought to be, on a pillow, and no efficient means are employed to prevent the spasmodic action of the muscles, the startings of the limb, the jerking of the broken ends, and the displacement of the fragments, then assuredly, in spite of all local and general measures, there will arise frightful swelling, pain, tension, and heat; the intermuscular tissue will be gorged with blood, and the circulation of the limb roused to a dangerous and alarming degree.

The attention of the practitioner when called to a case of severe fracture, will first be directed to the state of the nervous and vascular systems; he will have the patient placed as comfortable as possible, in the recumbent position, he will take

means to remove the effects of the shock, and to bring about reaction. He will then ascertain, with all convenient speed, the exact nature of the injury; this is done much more readily at first, and before blood is effused to any great extent; more so certainly than at a later period, when inflammatory swelling has supervened, and the sensibility of the parts is greatly roused. He will ascertain, as far as possible, how the accident occurred; in what direction the force was applied—his attention will be directed to the shortening and distortion of the member—the inability of the patient to raise it. He will, upon handling the part, discover unnatural mobility, and upon extension, the ends will be found to grate on each other. The existence of fracture being thus put beyond doubt, means are then and there to be adopted without delay to favour the operations of nature. The limb is laid straight, and this is done at first with but slight effort, wherever the fracture may be situated. Extension is made with one hand, resistance with the other, (such a position having been chosen as will relax any muscle, or set of muscles, that tend to produce distortion;) and perfect co-aptation is in this way effected. Proper apparatus is forthwith applied; great care is taken that there shall be no interruption to the return of blood, and that this, in fact, shall be favoured to the utmost by position. The effused fluid will then be speedily absorbed; the retentive apparatus will, in a few days, admit of being adjusted, and the bandages tightened, carefully avoiding any disturbance of the bones. No further local treatment, unless for compound fracture, or in case of formation of matter or other untoward occurrence, and very little constitutional management, will be demanded.

FRACTURES OF THE UPPER EXTREMITY.

Injuries of the bones which enter into the composition of the shoulder-joint, demand the most careful examination and attention of the surgeon; some of the signs of fracture and of luxation are very much alike, and a mistake in diagnosis may tend to the infinite trouble and annoyance of all parties concerned. The fearful consequences of applying great force in the case of frac-

ture, or, on the other hand, of leaving for many weeks a dislocation unreduced, need not be insisted upon here.

Fracture of the clavicle cannot well be overlooked or mistaken. This bone is generally broken about its middle; the motions of its extremity are weakened, it falls downwards and towards the chest, carrying with it the scapular portion of the bone. The other portion is somewhat raised by the action of the sterno-mastoid, and is protruded under the skin: occasionally this end of the bone has been forced through the integument. The fracture is often oblique, and is caused by force, applied in the direction of its shaft, by falls on the point of the shoulder. It, however, happens now and then that the bone is broken by a blow upon it; the solution is, in that case, transverse; there may be splintering, and sometimes wound, of the soft parts. Fracture is met with near one or other of the extremities of the bone, and in such cases there is less displacement; the fragments are confined by the muscles and ligaments; the existence of the solution is not so readily ascertained, but the treatment is less difficult. In order to bring the broken ends into contact, the arm must be raised upon and removed from the chest. It is not an easy matter to preserve this position. Part of the apparatus recommended and figured by Desault, appears to be the most simple and at the same time the most efficient. The thick wedge-shaped pad is the most essential part of it, and it may be retained in its position without so much and complicated bandaging, as employed by that great surgeon. The limb is elevated; the pad, secured in the folds of a shawl, is then placed in the axilla, the thick part uppermost; the ends of the shawl are passed over the opposite shoulder, and the ends tied in the axilla; soft pads are placed under the knots to prevent galling and excoriation. The inclination of the arm to the side over the fulcrum so secured, and its still further approximation by a bandage passed round the upper arm and chest, will bring the broken bones into a proper position, and retain them. A well-applied sling, to preserve the elevation of the limb, completes the proceeding. In three or four weeks the union will be sufficiently firm; the sling may perhaps be retained a short time longer.

Fracture of the acromion process is occasionally met with: it is caused by direct violence. The breaking away of this process close to its root, is marked by flattening of the shoulder, not to the extent, however, consequent upon luxation of the humerus, or fracture of the neck of the bone. There is always considerable bruising and bloody swelling, but that will not prevent the sensible signs of fracture from being discovered. The same means as recommended for fractured clavicle, and delineated p. 62, are here also employed with advantage. The spine and body of the bone are occasionally broken, but there is not much displacement. The chest is generally injured at the same time, and one or more ribs perhaps broken. The same general and local treatment will suit both, viz. abstraction of blood according to circumstances, and the application of a broad roller and scapulary.

The articulating portion of the shoulder-blade occasionally suffers from blows, or falls, upon the head of the humerus. This latter bone more frequently suffers solution of continuity, from such accidents, but it may remain entire, and the force communicated through it proves sufficient to injure the glenoid cavity. The neck of the scapula is rarely broken through, leaving the articulating surface entire. This is split up, starred, and comminuted. The consequence is an elongation of the extremity, marked flattening of the shoulder, prominence of the acromion, loss of power in the upper arm, all somewhat attributable to the bruising of the muscles. General swelling speedily ensues, in some measure removing the flattened appearance. The limb can, under these circumstances, though with much pain to the patient, be put into any position, applied close to the side, raised up without the body of the scapula moving on the ribs, so that the humerus is brought at right angles to the chest. The elongation of the limb, and prominence of the acromion, can also be made to disappear readily, by placing the fingers of one hand in the arm-pit, and the palm of the other on the point of the elbow, and thus lifting up the extremity. Crepitation deep in the axilla will then generally be detected by the fingers, or by the ear placed on the shoulder; whilst it is plain that the continuity of the humerus is entire, by the motions of its head, follow-

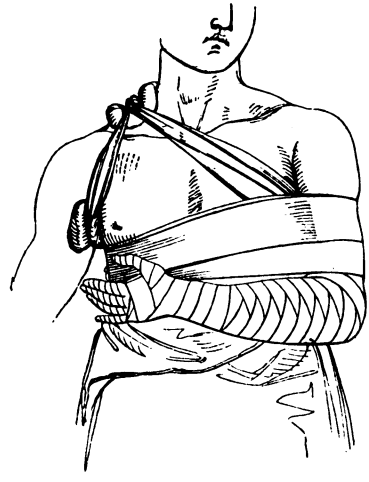
ing those of the shaft, when slight rotation is attempted. The history, the mobility of the limb, and the crepitation, will decide the nature of the case; the treatment is the same as that already directed for fractured clavicle. If the part has been much examined, and pulled about, and inflammatory swelling, with much pain supervenes, warm fomentations may be assiduously resorted to, without undoing the pad or bandages. The fomentation is best made by bags filled with chamomile-flowers, or bran, squeezed out of hot water, and applied at short intervals, and for half an hour, or an hour, at a time. The reduction of the fracture, and securing of the limb, supporting it as directed, will at once be attended with relief of all the symptoms, and will prove of itself the most powerful antiphlogistic measure. If that is attended to early, the necessity for general or local abstraction of blood may be dispensed with. But cases may arise requiring recourse to, and repetition of, both. The same remark applies to the next injury to be considered.

Fracture of the head and neck of the humerus is by no means an unfrequent injury, and results from great force, applied directly to the bone. The humerus is broken pretty high, from force applied to its lower end, or by the action of its muscles. The fracture of the head and neck may, however, be set down as the consequence of immediate violence; there is considerable bruising of the soft parts accompanying this injury, with great effusion of blood. The arm hangs powerless, the shoulder is flattened, the patient is sensible, on slight motion, of grating in the site of the injury; the extremity can be moved readily, in any direction; in fact, the signs are the same as above detailed, and which are attendant upon injury of the glenoid cavity. The crepitation is here, however, more easily detected; and if the head of the bone is separated by transverse fracture from the shaft, below the tubercles, it can be felt in its place, uninfluenced by rotatory, or other motions of the limb. Displacement of the head, with accompanying fracture, has occurred, but is, from the nature of things, most rare. The luxation must precede the fracture. For an account of the treatment, the reader

is referred to the preceding observations. Perfect and immediate ease follows the adjustment of the axillary cushion.

If the fracture have occurred in the upper end of the bone, betwixt the insertion of the tendons of the latissimus dorsi, pectoralis major, and deltoid, then a leather splint may with advantage be applied, from over the shoulder-joint, to the point of the elbow. A piece of sole-leather, dressed expressly for surgical purposes, without oil, is cut so as to fit the limb; it is soaked and softened in warm water, and then applied and retained by a roller. It soon becomes a firm mould to the limb; it can be stuffed with wadding, or lined with wash-leather, and thus forms an excellent support and protection to the injured part.

In all the injuries of the bones of the shoulder and upper arm, it is advisable, in the first instance, to give support to the lower portions of the limb, in order to prevent congestion in the vessels and bloody or serous engorgement. This is almost certain to result to a painful and inconvenient degree, if this precaution is neglected; from pressure on the veins in the axilla, by the pad, and on the cephalic, by the extensive ecchymosis, and to such an extent as sometimes to render confinement to the recumbent position, a temporary removal of part of the retentive apparatus, and recourse to local and constitutional antiphlogistic treatment, absolutely necessary.



The separate bandaging of the fingers, hand, and fore-arm, for the purpose here indicated, the position of the pads, the mode of fixing the shawl, which contains the wedge-shaped axillary one, and the bandage surrounding the chest, are here exhibited. A sling completes the apparatus for all the injuries of the clavicle and shoulder-joint here treated of, as well as for some others to be noticed in the next chapter.

The shortened, distorted, and bent appearance of the upper arm, loss of power, following an accidental application of great force to the limb, or powerful muscular exertion, will leave no doubt as to the os humeri having given way. The lower fragment is drawn inwards and backwards, and generally overlaps the upper. This bone is more frequently broken than any other, by the action of its own muscles, the osseous tissue may perhaps, in some of the cases, be in such a state as to give way under the application of but slight force. An opportunity of examining the bones of the subject of the following case occurred a few days ago.

CASE.—Mrs. E., aged 49, was admitted into the North London Hospital under Mr. Liston's care, January 8, 1836, on account of simple fracture of the left humerus, which had taken place from the action of the muscles whilst turning in bed. She is in a state of great emaciation, and labours under carcinomatous tumours of various parts of the body; both mammæ, especially the left, being excessively hard, and fixed to the integuments which are tuberculated and discoloured, and also to the subjacent parts. She has several tumours of the neck, and one especially very hard, under the left angle of the jaw. The poor woman has been bed-ridden for the last two years on account of a painful affection of the lower part of the spine and right hip. Since then the catamenia have ceased. She left the hospital in the end of March with this bone quite straight and firmly united.

On the fourth of July she was again made a patient, along with one of her children, on account of fracture of the upper third of the right humerus, which occurred whilst she was reach-

ing out of bed, and trying, with a stick in her hand, to extinguish the flames which enveloped the child, her clothes having caught fire. In September she left the hospital, but to return on the 9th of March, 1837, with a second fracture of the left humerus, a little above its middle. This happened from the action of the muscles in cutting a slice of bread. On the 27th, on making some slight exertion to move, though placed from the first on a water-bed, she broke the right arm again, immediately above the insertion of the deltoid, and nearer the head of the humerus than the former fracture. Her strength gradually declined, and death terminated her manifold sufferings on the 22nd of April. (Abridged from the Case-book of the hospital.)

The tumours described above were all carcinomatous, as were tubercles in the uterus and other internal organs. There was disease of the articulation of the body of the last lumbar vertebra, with the sacrum, and of the right sacro-iliac synchondrosis, ulcerative absorption, but with only a small quantity of purulent secretion. I had expected to find the long bones full of oily stuff, and their shells exceedingly thin, as in bed-ridden subjects; from their uniting readily, I did not suppose that any malignant disease had attacked the meditullium. The fractures, excepting the last, were firmly united, and the bones, contrary to all expectation, were ascertained, on a careful analysis by Dr. Davy, that most indefatigable and accomplished chemist, to contain, as seen below, a much greater quantity of earthy matter than in their normal condition.

Water . .	6.2	Or without water.	
Phosphate of Lime	61.5	Phosphate of Lime	66
Animal matter	32.3	Animal matter	34
	100.0		100

The fractures of the shaft of the humerus are sometimes oblique; they may be comminuted, and are occasionally attended with wound of the soft parts. The fracture of the lower or distal end of the bone, is not unfrequently complicated with injury to the elbow. The condyles are separated by a longitudinal fissure extending into the joint, and considerable disfigure-

ment arises in consequence, or from the effusion of blood into and around the capsule. By careful manipulation, and by attention to the motions of the articulation, the kind of injury will be ascertained. The general principles already laid down are to be followed out in the management of these as of other fractures; there will in general be no great difficulty experienced in the reduction. I met lately, in private practice, with rather a complicated case of fracture in this situation, and one not very manageable. The patient had been tumbled out of a cab early in the forenoon, and pitched on his left elbow. Great swelling immediately ensued, which had not been subdued by leeching or lotions, when I saw him late in the afternoon. There was great shortening and deformity of the limb in consequence of the displacement backwards of the condyles, which were broken off transversely from the shaft along with the bones of the fore-arm. The end of the humerus had been turned, as it were, upon itself, the broken surface resting upon the back of the shaft and pointing forwards. There were present the signs of luxation of the fore-arm, but with still greater distortion, and with great mobility; on handling of the parts, crepitation was distinctly perceived. The reduction was accomplished readily by relaxing the triceps, and making extension and counter-extension. If the fracture is compound, or much complicated, it may be proper to keep the patient in bed for a short time, until the violence of the symptoms has subsided, and the curative process is somewhat advanced. The fore-arm is bent at right angles, and the whole extremity supported on a pillow; then, by the application of pasteboard, or leather splints, cut out for the occasion, so as to fit the limb accurately, in the bent position, the bones will be kept straight and at rest. These splints should be long enough to embrace the joints above and below; they should not be so broad as to meet or overlap; they are softened by immersion in warm water, padded and applied, after co-aptation is effected, one on the outer and the other on the inner side of the limb; in cases of compound fracture, where it may be necessary to remove the outer splint from time to time, the apparatus may be conveniently retained by the

looped bandages. The wound will, of course, be first attended to. If very small and clean, it may close without the secretion of pus. In general, more or less discharge takes place; and it may ensue some time after the accident, in consequence of the formation of abscess in the deep cellular tissue. It is seldom advisable to stitch wounds accompanying fractures: accidental wounds of considerable extent, as already remarked, rarely unite by the first intention. A bit of dry lint is laid over the opening; it becomes soaked with blood, dries, and adheres; it should not be interfered with, unless it appears that matter is confined. It may be necessary to enlarge the wound connected with fracture, so as to favour the reduction when there is much displacement, and spasmodic action of the muscles. It may be advisable, with the same view, to remove with the saw, or cutting-pliers, the sharp end of bone; both proceedings, in some cases, may with advantage be resorted to. Again, the surgeon may be called upon to enlarge the opening for the purpose of removing detatched pieces of bone, at the time of the accident, or during the progress of the cure: he may have to enlarge the opening to permit the more free escape of purulent secretion, and for this purpose, one or more dependent incisions may be required. All this must be left to the judgment and prudence of the practitioner in charge of the particular case. There will be no occasion to confine the patient, who has suffered a simple fracture of the bones of the fore-arm, to the recumbent position. After bandaging the lower part of the limb from the points of the fingers upwards to immediately below the injured part, the splints are adjusted and retained by a simple roller. The limb is supported by a sling. The bandage can readily be undone if any occasion should arise to render it necessary. In fractures, scientifically treated from the first, swelling need not be dreaded to such an extent as to render it necessary to slacken the roller; after a few days it is undone and re-applied, so as to make the splints embrace the limb more closely. In using the splints of leather or pasteboard, it is advisable, in muscular subjects, to apply outside of the bandage which retains these splints, one or more additional splints of firmer material; this is

only a temporary and precautionary measure, and these, with the roller which secured them, are removed in a few hours, so soon, in fact, as the permanent splints have become dry and firm. A thin piece of deal, a piece of strong bookbinder's pasteboard, or millboard, not softened, or a slip of thin metal, will answer the end sufficiently, when the splints made of board, pasted on leather, are not at hand.

The olecranon process may either be struck, or pulled off, from the shaft of the ulna, whilst the fore-arm is bent, by the forcible action of the triceps. The simple fracture unites readily by ligament, and the shorter this is, the more serviceable is the limb afterwards. The compound fracture is repaired with difficulty. In many cases, in spite of every care and attention, disease of the joint, and of the bones composing it, supervene, and the failure of the patient's health demands the last alternative, amputation. This, however, is fortunately not a necessary consequence of the division of the bone, the integuments over it, and the capsule of the joint. Some few patients are lucky enough to get over the risks, and preserve the arm when the division of the soft parts is inconsiderable. Every means should be taken to close the wound, and preserve the most perfect quiet, and relaxation of the triceps by position. In simple fracture the process is felt separated perceptibly by a hollow space, and this space is increased by bending the fore-arm on the humerus, as seen above. The extended position, so as to render the distance very short, is preserved by a hollow wooden splint on the fore-part, extending from above the middle of the upper arm, to

below the middle of the fore-arm; this is retained by the turns of a roller applied without any degree of tightness. There is no purpose served by turning the bandage in the form of the figure of 8 round the joint behind, with the view of pressing the broken surfaces into contact; nor is any apparatus, straps and buckles, &c., for this purpose, of the least use. The surfaces would not unite readily, if at all; temporary callus cannot be readily formed, and the growing together of the solution of continuity, otherwise, is but a slow process. It is not, besides, desirable to procure bony union, were it possible. A short ligament is stronger and not so likely to be detached, and the limb becomes as serviceable as before the accident. The coronoid process is occasionally pulled or pushed off from the shaft, more especially in young subjects. I saw a case of it lately, in which the injury arose in consequence of the patient, a boy of eight years, having hung for a long time from the top of a wall by one hand, afraid to drop down.

One or both bones of the fore-arm are often broken, and at various points. From falls on the palm the radius may give way close to the wrist, or this bone may break near its proximal end, and the ulna near the wrist. These bones are often bent in children, by force so applied, or they are partially bent and partially broken. The osseous shell containing but little earthy matter, suffers solution of continuity on the convexity of its curve, and this is perceived readily by the crepitation when the parts are reduced, by a little force, to their normal shape and condition. Again, either or both bones may be broken transversely, in any part of their course, by a blow. The injury is generally detected without difficulty; the fracture of the head of the radius is sometimes overlooked and perhaps mistaken for luxation of the wrist or mere sprain. A strict and searching examination must be instituted, whenever immediate deformity, in this situation, follows upon an accident. The loss of power and distortion when both bones are broken, or when even the shaft of one has given way, will at once lead to the discovery of the seat and extent of the injury. If one remains entire, the ends of the other are drawn

towards it by the action of the pronators, but there is, of course, no shortening; when both bones are broken, the interosseous space is diminished from the same cause.

As regards treatment, the limb is brought to its normal form by slight extension, and placed in a middle state betwixt pronation and supination, at a right angle with the humerus, the most easy and convenient position, and so secured by a couple of splints, which embrace the elbow, wrist, and fingers: these are fixed by the turns of a narrow roller.

The fracture of the metacarpal bones and phalanges do not here demand much notice. When simple, they are to be managed secundum artem with narrow slips of wood, leather, or pasteboard; or they may conveniently be put up with thick lint, dipped in a strong solution of glue or gum acacia, or white of eggs: this is covered with an additional layer of lint and a narrow bandage, the whole steadied provisionally by a small deal splint. Too frequently, the fracture is extensive, several fingers are smashed, the soft parts are lacerated, the bones comminuted, and the joints opened; as by the explosion of gunpowder, or entanglement of the part in machinery. Amputation is often demanded, but as little as possible of this useful member is to be taken away—the smallest part of it being of the utmost use; even one finger, or part of one, more especially if the thumb, can be preserved. The forefinger, for instance, has been alone saved out of the general wreck; or the middle and little fingers, or the thumb and a mere stump of the middle one, the proximal phalanx only, and yet, after a time, the loss of the others has been much less felt than could be imagined, and the person—able to follow his employment, which the

loss of the whole hand would have rendered impossible—has been most grateful for the considerate management of his case. The upper extremity, it must be recollected, has greater power of recovery than the lower, and injuries of it are, besides, from its size and position, more manageable.

Fractures of the bones of the chest are not, unless the injury has been very extensive and many bones are involved, attended with permanent displacement. The integuments are sometimes divided, more frequently the internal investing membrane, and occasionally the contained organs. The signs of fracture of the ribs or sternum are sometimes detected with difficulty, and more so when, perhaps, one bone only is broken, and at a point where it is thickly covered by muscles or fatty matter. The grating may be felt by the patient when he moves or coughs, and yet be with difficulty perceived by the surgeon. The danger is considerable when great force has been applied, when several ribs have been driven in, and the internal parts are consequently involved. Emphysema is the immediate consequence, effusion of blood, or bloody serum, may proceed to a prejudicial extent, and inflammatory action is to be dreaded. The bones are to be steadied and the motions of the chest restrained so far, by a broad bandage or belt passed round it; this is prevented from slipping down by the application of what is called a scapulary or split cloth secured to the bandage behind: one end is passed over each shoulder and fixed in front. If air has filled the cellular tissue of the neck to a troublesome degree, it can be allowed to escape by a few punctures with the point of a lancet. Inflammatory action is to be guarded against and combated, if it should arise, by venesection, to a sufficient extent, and repeated, as circumstances may demand; by antimonials, aconite, and purgatives. Circumstances may demand, at some period of the case, an opening into the cavity of the chest, for the evacuation of purulent or other effusion. This will be considered, the necessity for, as well as the mode of operating, in Chap. XIII.

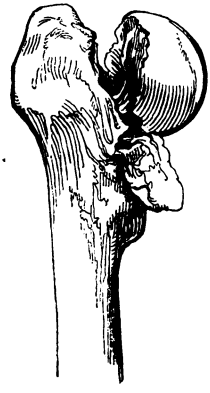
Perhaps the most difficult of all fractures to manage, and bring to a satisfactory conclusion, are those of the thigh. The

bone, throughout, is surrounded by large and powerful muscles; the upper part follows, and is so affected by the motions of the trunk and pelvis, that it is a troublesome task to keep the injured parts quiet, and in a favourable position for union. The thick covering, also, in the upper part of the limb, sometimes renders the diagnosis a matter of some difficulty. Deformity and shortening of the lower extremity arise from various sudden or gradual changes in the relation or structure of parts about the hip-joint. On being called in to any case of the kind, a searching examination of the limb, and strict inquiry as to the history and previous condition, must be immediately instituted, in order to guard against error, and decide on the line of proceeding. The limb is shortened more or less in fracture of the upper part of the femur; at first, this may not be very perceptible, but it becomes gradually more and more apparent. The degree of shortening will depend upon the place and direction of the fracture, and the extent to which the immediate investments of the bone are torn. In fracture within the capsule, and where the fibrous envelope of the neck of the bone is not completely torn, there can be but slight displacement; and by the most attentive comparison of the two limbs, abbreviation of the one which has sustained the injury may not be detected. Osseous union may possibly take place; if it does not, then the neck of the bone will undergo alteration, and will be acted upon by the absorbents, so as to render the extremity an inch or more shorter. In all fractures completely within the capsule, the shortening is not at first great, perhaps not more than three quarters of an inch, and it is necessary that the pelvis should be placed quite straight, and that a close comparison of the two limbs, of the ancles and knees, should be made, in order to ascertain exactly how great the difference of length really is. In fracture partly within the joint, partly without, or in those passing altogether outside through the trochanters, the diminution in length is more perceptible, and the signs of fracture more readily detected; the toes are everted in the majority of cases, in many they are inverted, in some there is little or no deviation

in either way. This remark applies to all the fractures about the hip, to those within as well as to those without the joint. The position would appear to depend upon chance, in a great measure, and upon the way in which the limb has bent under the patient, or has been placed, on his being taken up. The position may be altered during the examination of the limb; it may at first be inverted, and afterwards, by the weight and inclination of the limb and foot and the action of the powerful rotators outwards, the toes may become everted. Fractures in this situation are almost uniformly the result of force applied directly to the trochanter major. Information that such accident has occurred, and that it has been immediately followed by loss of power, distortion and shortening of the limb, will lead to a suspicion of fracture, and to the institution of a proper manipulation of the limb to ascertain the fact. In some cases, any doubts are readily removed as to the nature of the injury that has been inflicted on a previously sound limb, by an immediate and perceptible shortening and marked eversion of the foot, following upon a fall on the hip. Fracture can alone account for these appearances. If inversion, however, exists, the difficulty of forming a diagnosis will be much greater. It is to be kept in mind that, in all fractures, there is no fixation of the limb, it can be moved in all directions; in fact, there is unnatural mobility, and, in the case under consideration, the limb can be extended very much farther than when the bone is sound. The object, in all these cases, will be to detect crepitation; by slight extention and rotation, this is, in the majority of cases, easily effected. But difficulties do arise in ascertaining the existence of this sign; the bones are thickly covered—the tissues may be loaded with effused blood—inflammatory swelling may have been allowed to come on—the muscles may be rigidly and spasmodically contracted, or the neck of the femur may be driven into and wedged in the cancellated texture of the trochanter. In proportion to the difficulties of the case, so must be the anxiety and care of the surgeon in conducting his inquiries and examination with the hand or ear over the part; whilst the proper motions of the limb are made, grating will be perceived,

and the diagnosis completed; all the other signs of fracture may exist singly. The limb is shortened in consequence of displacement of the head of the bone from the cotyloid cavity, but the motions of the limb are abridged, and in the greater number of cases there is marked inversion of the foot. The appearance of the hip, the position of the trochanter and head of the bone, will lead to a proper understanding of the case, independently of the consideration of the mode in which the force has been applied. Eversion is often caused by mere bruising of the glutæi; the limb is altered in form and length by disease of the articulation; or whilst this affection is in progress an injury may be inflicted, leading, perhaps, to still further alteration in the form of the extremity; some of the signs of fracture or dislocation are thus presented. Or a limb, shortened by disease which has long ceased, may be subjected to accidental and violent contusion, and some of the signs of fracture may appear, there is marked shortening and probably eversion; but the limb is wasted, and the shortening is not recent. These cases are not imaginary; they occur in practice, from time to time, and the surgeon must be always on the alert, always watchful, must be careful in his inquiries, and prudent in the course he follows, otherwise, he may commit serious and painful mistakes in treatment. Gradual shortening of the lower extremity often ensues upon contusion of the hip, in persons advanced in life, in consequence of interstitial absorption of the neck of the thigh-bone, and alteration in the angle in which it is set on to the shaft. The head of the bone undergoes a change of form; it becomes flattened and expanded, and the cotyloid cavity is made to correspond; deposits of dense osseous matter often take place around; the cartilage is sometimes in part absorbed, and replaced by a porcellanous polish of the condensed osseous tissue. These pathological changes are not confined to the aged, as has been shown by my excellent friend, Mr. Gulliver. This cause of lameness must be kept in view, the risk of its occurrence explained to those who have suffered injury of the part, and, if possible, prevented by treatment.

Complete solution of continuity of the neck of the femur in aged persons, cannot be expected to unite by bone. Independently of the diminished power of repairing any waste or damage incident to the period of life, many general and local circumstances combine to render bony union very difficult and improbable. Old persons bear confinement in one position badly; with all attention, ulcerations and sloughing of the nates and back take place, the circulation being so weak that blood is not forced into parts even slightly compressed; it is not easy to keep the broken surfaces in apposition for any lengthened period; the union cannot be effected, for a time, here, as in other parts of this and other bones, by thickening of the surrounding tissues, and by deposit of new bone on the surface of the old; the broken surfaces are besides bathed in synovial fluid, increased in quantity, and perhaps vitiated. The head of the bone is retained in its place by the round ligament; the surfaces of that and of the neck become smoothed and adapted to each other by constant motion, and the trochanter major is approximated to the border of the acetabulum, in consequence of the almost entire disappearance by absorption of the cervix femoris, as already noticed.



The capsular ligament is strengthened, and the solution of continuity is often replaced, by fibro-cartilage or by strong ligamentous bands as here represented. The patient, a female, from whom this specimen was obtained, suffered fracture seven years previous to death, in consequence of a fall down a flight of steps, in which she struck the trochanter with great force; this took place at the age of sixty-three: the changes in the form of the bone, and the nature of the injury are well shown. This is the termination which it is generally desirable to promote. Great prostration of strength, probably a fatal termination, is likely enough to follow long confinement of an aged person to bed and very much to one position; no good purpose, as

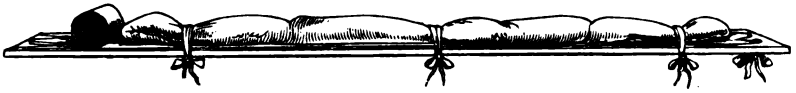
has been shown, can result from such practice. Osseous union of the neck of the femur does take place, though very rarely indeed, as when the separation has not been complete. The natural cure, in those advanced in life, is by ligament; to favour this, to prevent inflammatory action running high, to avert the suffering and danger consequent upon it, and to render the patient as comfortable as possible under the circumstances, the injured parts must be kept for some time at rest, and in an easy position. The patient should be placed in bed, (on one of those clumsy machines, called fracture-beds, if the practitioner and patient think it suitable and right,) and the knees bound together; the legs may be bent and kept so over pillows placed in the ham. A wooden frame covered with a cushion, and which can be raised or depressed at pleasure—as used by my friend Sir R. Dobson at Greenwich Hospital—is the most simple and efficient means of attaining the desired object, and is much superior to any other contrivance in the way of fracture-bed or splint, which I have seen used in such cases; it is advisable, in order to prevent infiltration from pressure on the vessels in the ham, to bandage the feet, from the toes upwards. By interposing pads betwixt the ancles and knees of the sound and injured limb, and fixing them so by the turns of a roller, perfect quietude of the part may be obtained, in the extended position. Fomentations should be assiduously made over the hip, and local abstraction of blood may be practised, if need be, according to the nature of the symptoms, and the vigour of the patient. The confinement must be as short as possible; so soon as the painful feelings have abated, perhaps at the end of a few weeks, the patient must be encouraged to move a little; he ought to be got on crutches, so that some use of the limb may be speedily recovered. Fractures immediately outside the joint, through the trochanter, even in very old persons, unite readily enough. It may not always be possible to decide exactly, whether the joint is involved or not; but the greater degree of shortening and mobility of the limb, the more distinct feeling of crepitation, will often enable the surgeon to distinguish the nature of the case and to decide upon the practice. In all solutions of continuity of

the femur in young subjects, and in those apparently outside the joint, in such as are advanced in life, the object of the surgeon must be to replace the separated parts as nearly as possible, by undoing the eversion or inversion, as may be, and extending the limb to its natural length. It ought to be made to appear after co-aptation, rather somewhat longer than the sound one, allowance being thus made for the stretching of the lower articulations. In this position it is to be preserved immovably for at least six weeks, so as to afford every chance for union taking place. The most effectual position and, upon the whole, the least annoying to the patient, is that with the limb extended. By the use of a very simple, cheap, and easily-obtained apparatus, the retention can be fully accomplished much better than by the splints of Desault, Boyer, or Hagedorn: certainly much better and more creditable cures can be thus made of all fractures of the thigh, than in any other position of the limb or trunk, and by the use of any complicated and expensive machinery, or by any supposed more soft and easy method.

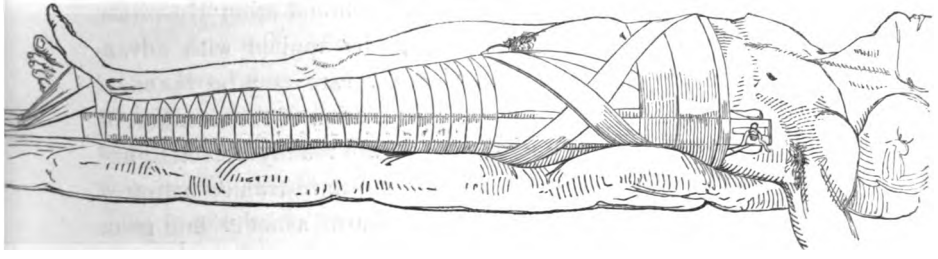
Some prejudice has always existed against the straight position of fractures, and it is said that certain muscles must act, in pulling the ends asunder. In trying to humour one set, however, others are necessarily put upon the stretch and excited; it is found that all become quiet enough very shortly, and the bones fall into their natural position. No force is used in making or keeping up the extension, and by a comparison of the limbs it is in our power always to observe and correct any deviation in length or form.

The apparatus consists of a plain deal board of a hand's-breadth for an adult, and sufficiently strong; narrower and slighter, of course, for young patients. It is made to suit the particular subject of the injury, to extend from opposite the nipple to two or three inches beyond the sole of the foot. It is perforated at the upper end by two large holes, and made with two deep notches at its other extremity; a sufficient hollow or perforation is made opposite the malleolus. A pad of corresponding breadth is attached by a few pieces of tape; a roller is split at the end, and then tied through the openings in

the top part of the splint, unrolled so far and fixed for the time to the lower end of the pad. The apparatus thus prepared for application is here represented.



The reduction being effected by a little gentle and continued extension of the limb, while the pelvis is fixed, the position is preserved by an assistant placing one hand over the dorsum of the foot and the other upon the knee; a narrow roller is turned from the toes to a little below the site of the fracture with a moderate degree of tightness; this is done to prevent infiltration of the limb, in consequence of pressure by the perineal band, which is now placed under the patient. It consists of a large soft handkerchief or shawl, with some tow or wadding rolled up in it. The splint is now laid along the outside of the limb, the roller, already spoken of and shown, is passed under the sole of the foot, and is turned round the ankle and heel, previously thickly padded, to prevent the painful effects of pressure, the resistance to the extension falling principally upon these points. The roller is carried repeatedly through the notches in the further end of the splint, as it is crossed over the dorsum of the foot, and ultimately turned round the limb to near the groin. The object in pursuing this plan must be apparent: by the attachment of the end of the roller and its subsequent arrangement, the apparatus is prevented from slipping upwards, and it is made, as it were, of a piece with the limb; the ends of the band are passed through the perforations,



drawn with moderate tightness and firmly tied; a few turns of a broad bandage round the pelvis and chest complete the proceeding.

The perineal band, by which the splint, and with it the limb, is pushed downwards, is attended to from day to day, and tightened as it becomes relaxed, in order to overcome any tendency to shortening. In consequence of the great length of the splint the extension is made pretty much in the direction of the bone, and is generally borne without a murmur: in fact, patients who have been so unfortunate as to have occasion to submit to treatment for fracture of the thigh more than once, and who have had tried upon them previously the bent position, the leg and thigh being placed on a double-inclined plane, on a fracture-bed, have in forcible language expressed their preference to the extended position, on the score of comfort.

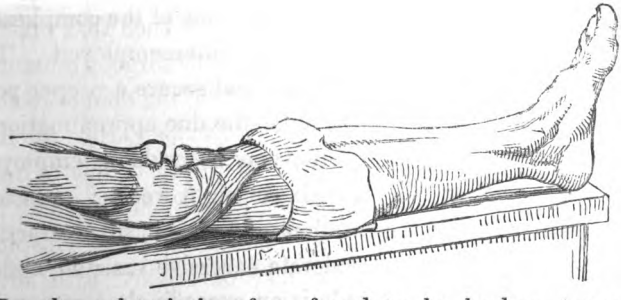
In those who have suffered fracture of one thigh previously and have recovered, with a certain degree of shortening, it may be well to arrange so that the two limbs shall correspond as nearly as possible. By adopting the straight position in all fractures of the thigh, the surgeon has it fully in his power to preserve the limb of its original length and proper contour. Injury or disease of the ankle or of the perineum, on which points the extension and counter-extension fall, and which sometimes, though rarely, have occurred along with fractured thigh, will somewhat interfere with the proceeding recommended. If the injury is such that pressure cannot be borne in either of these situations, the surgeon must make the best of it he can, with the limb placed on the double-inclined plane—the apparatus recommended at p. 75—or Earle's fracture-bed may be employed; the leg-splint of M'Intyre, or that of Amesbury, or the much more simple, though equally efficient one, now used for fractured leg at the North London and other Hospitals, with a sufficiently long thigh-piece, may be applied with advantage, though with the prospect, whatever care may be taken, of a certain degree of retraction and abbreviation of the member.

Fractures of the shaft of the femur are readily detected, and not to be mistaken; by the irregular and unrestrained action of certain muscles, the broken ends are drawn asunder and made

to overlap. The upper portion is generally protruded forwards by the action of the psoas and iliacus, whilst the lower is drawn inwards and backwards by the adductors of the femur and flexors of the leg; the lower portion, besides, is turned outwards upon itself by the weight and inclination of the foot and limb, which cannot now be resisted by muscular action.

Fracture of the lower portion is not unfrequently accompanied by a fissure extending into the joint, and detaching one or other of the condyles; the outer condyle is occasionally broken off without transverse fracture. The fracture of the thigh in the lower third may be treated by the bent position on a double-inclined plane, as already described, but with less comfort to the patient, and with the risk of his having a shortened limb. The straight position of the limb, maintained by the apparatus described and delineated, p. 77, is to be preferred, in all the solutions of continuity and wheresoever placed, whether in the upper, middle, or or lower thirds of the bone.

Fracture of the patella, as that of the olecranon process, differs in character, according as it is caused by sudden bending of the limb and the action of the extensors of the leg, or by injury from without. In the one case the fracture is transverse, and the separation generally very complete, the fibrous investment and periosteum being extensively torn.



In the other it is often found to be broken transversely, and at the same time longitudinally, to be starred and comminuted. In all fractures of the patella there is a certain effution of blood into the joints and surrounding cellular tissue This is greater in fractures from blow, as is also the excited action which follows. Union of longitudinal fracture readily takes

place by bone, as will also the transverse, following external injury, though with difficulty and slowly: it is a rare occurrence, and one not to be expected or favoured. There is a specimen of bony union in my collection obtained from a patient who fell from a great height and splintered the patella; inflammatory action had run high, and one portion of bone had perished, whether from this cause or from the immediate effects of the injury, it is impossible now to say.

The ligamentous union is more rapid and firm; it is besides not so likely to be interrupted or dissolved. The shorter, however, the ligament, the more serviceable and strong will be the limb. The treatment consists merely in favouring the approximation of the upper to the lower fragment, which, of course, is not displaced, by position of the limb. The limb is placed on an inclined plane, as represented in the last page, which comes half way under the thigh: to prevent accidental separation, as by the limb slipping off the tray on which it is placed, it is advisable to apply a wooden or pasteboard splint in the ham, extending from the middle of the thigh to the middle of the leg, hollowed out, fitted, and padded properly; this is retained by a roller from the toes to above the knee, the whole surface being covered, but with no degree of tightness. The bandage is not to be drawn firmly in the form of the figure 8, with the view to force the fragments into close contact, nor are any straps and buckles for the same purpose advisable—none of the complicated and useless machinery, in fact, which is often employed. The roller is merely applied to fix the splint and secure a proper position, and this alone may be trusted to for the due approximation of the broken surfaces. Passive motion may be gradually employed, with frictions, douches, &c. after six or eight weeks; occasionally, at an earlier period, fomentations and even local abstraction of blood may be required, to moderate excessive vascular action.

Fracture of the tibia and fibula is an exceedingly common injury, more especially in the labouring classes, and one which is very often badly managed, for want of proper apparatus. The possession of a good set of splints is not all that is wanted; a surgeon must have head to know how to make use of them. A case came to my knowledge the other day, in which a fractured leg was laid in

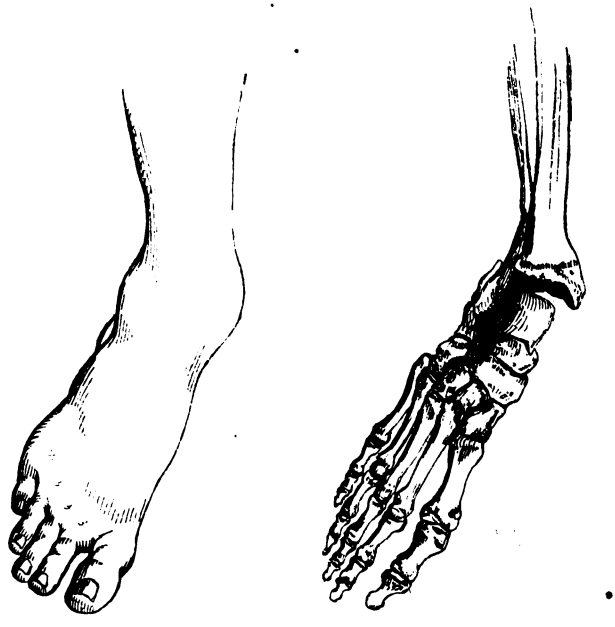
one of the new splints without pad, bandage, or foot-sock, to support the heel; the consequence was, that the foot falling backwards through the aperture left for the purpose of obviating pressure, brought the back of the leg in contact with the edge of this opening, where it was allowed to rest until the tendo achillis was exposed by ulceration.

It is possible, by vast care and constant attention, to preserve the limb of a proper length, and straight, by the use of very rude and clumsy contrivances, such as junks, or fracture-boxes. However, a cheap, simple, and efficient splint, on which a broken leg could be placed, adjusted, and secured, during the time necessary for the completion of the process of union, and which would admit of the removal of the bandages for the purpose of attending to the state of the soft parts, has been long a desideratum. Many excellent splints have been contrived, modifications of the fracture-box, and the double-inclined plane, such as the cradles of Sir Charles Bell, of M'Intyre, Amesbury, Greenhow. These are, however, liable to many objections; they are clumsy and cumbrous, unnecessarily complicated, and expensive: all faults are, it is expected, done away with in the machine now used at the North London Hospital, and which is coming into very general use both in public and private practice. Sets of these splints may be had of Messrs. Sheldrake and Bigg, Leicester Square, and of other instrument-makers and cutlers, at a very moderate price.

But as regards the fractures, these are the result of force applied immediately to a part of the bone, of sudden and rapid motion of the upper part of the member, the foot and lower part being arrested, or of force applied in the direction of the bones. One or both yield, the fracture is transverse or oblique, the two bones being broken at corresponding points; the tibia is broken, say in its middle, the fibula at two points

towards its extremities, an instance of which, removed from a lad who had met with compound fracture at sea, and presented by my friend Mr. Busk, of the Hospital Ship, Greenwich, is here represented; or the tibia is fractured near the ancle, whilst the fibula has separated close to the knee-joint, as happens when a person alights from a height on the sole of the foot, the muscles being prepared, so that neither inversion nor eversion take place.

Fracture of the leg is sometimes much complicated in consequence of severe bruising and laceration of the soft parts, or comminution of the bone: one or both bones may be thrust through the skin, and sometimes the upper end is contused by coming in forcible contact with the ground. Attendant upon violent twisting and partial displacement of the foot, fracture of the lower end of the bone is often met with. As a consequence of eversion, the fibula is broken a short way above its articulation with the tibia, at the same time the point of the inner malleolus

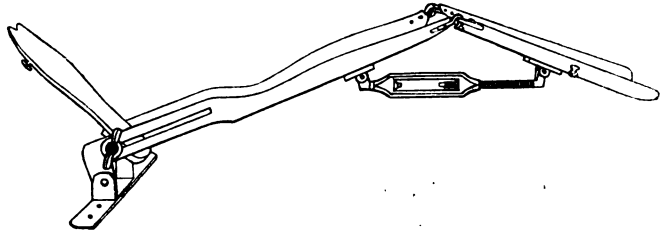


may be detached along with the internal lateral ligament, or the

outer malleolus may be merely snapped short off. The history of the accident, if it can be obtained, the everted state of the foot, the inability to rest upon it, the effusion of blood in the sheaths of the flexor-tendons of the toes, the depression on the lower and outer part of the limb, will lead to an examination: on replacing the foot, and pressing the fingers in the course of the fibula, looseness and crepitation may be perceived.

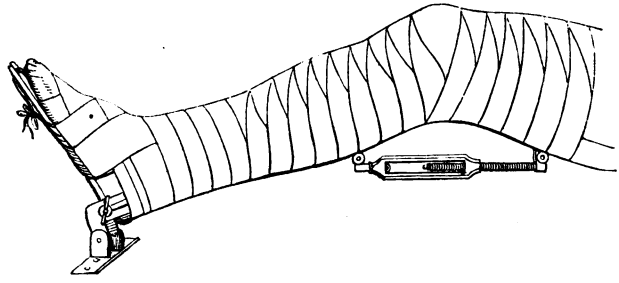
As a consequence of a twist of the foot inwards, the internal malleolus is snapped off, and sometimes a more extensive oblique fracture, passing from the articular surface of the tibia thus, and detaching that process, is occasioned. At first, the nature of the injury is readily ascertained; but after inflammatory swelling has gained a head, very careful manipulation will be necessary to enable the surgeon to say whether fracture exists or not. In all injuries of this nature, a determined and attentive examination should be instituted at once, and thus much pain and trouble will be saved. The necessity for all after-handling of the parts is in this way prevented, and a proper line of practice, from the first, adopted to forward the cure.

Fracture of the leg is to be immediately reduced: the length of the limb is ascertained by measuring the sound one from the bend of the knee to the heel. The simple splint spoken of



above, and here represented, is adjusted accordingly: it is padded, and the pads secured by a few bits of tape. The limb

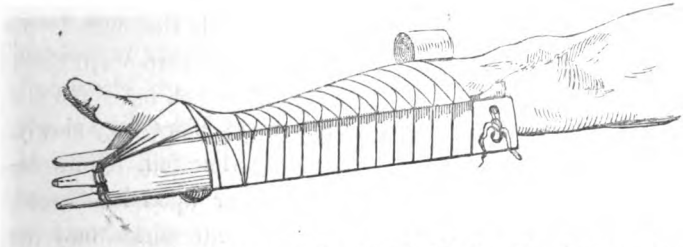
is raised, and placed on the apparatus, a sock, with a piece of tape attached opposite the ball of the great toe, having been previously put upon the foot. This tape is turned over the foot-board, and is fixed to the knob on its distal surface; the leg is put into proper shape, and the broken ends of the bones are ascertained to lie correctly, straight, and in perfect contact. They are so secured by a roller, which embraces the whole, and which is made to adapt itself neatly and accurately by reverses, where the swelling and inequalities of the limb would cause the bandages to lie unevenly. By passing the bandage as here shown



under the screw, the angle of the leg and thigh-pieces can be varied so as to allow the fragments to be adjusted perfectly, and the limb to lie comfortably for the patient. In all the fractures above the middle of the bones, the more nearly the limb is put straight, so as to relax the extensor muscles, the better will be the position of the ends of the bones in regard to each other; in fact, if the limb is bent, and the quadratus femoris, and its tendon put upon the stretch over the convexity of the articulation, the upper fragment of the bone will be made to project forwards: and if this is not attended to in time, and the limb differently placed, the skin may give way by ulceration, and a simple fracture be thus converted into a compound one. In all cases of fracture of the lower limb, it is advisable, for reasons given at p. 58, to elevate the whole member, by placing the end of the splint on a stool or block of wood, or by slinging it from the ceiling or bed-frame. In a very short time from the infliction of the injury, the patient may be allowed, and more especially if the fracture is simple, to get out of bed, the limb being so

securely attached to the splint, and rendered so independent of the motions of the trunk, that no displacement can possibly occur. The cure thus goes on much more pleasantly and quickly, and the patient does not suffer in health from confinement. By turning the screw slightly, from day to day, passive motion is given to the knee. This screw is no new addition to a splint; it was used many centuries ago, and is represented by Jerome of Brunswycke in his surgical works published in the beginning of the sixteenth century.

The fractures of the malleoli are conveniently and well managed in the manner and by the simple apparatus recommended by the late celebrated Baron Dupuytren, somewhat modified. It consists of a short wooden splint, in all respects similar to the thigh splint, perforated and split at the ends, and with pad and bandage similarly adjusted. The splint should extent from the head of the tibia or fibula, respectively, to three or four inches beyond the heel: the pad should be thick at its lower end, or, by having it longer than the splint, the end may be doubled under, so as to effect the object. The apparatus is applied as here represented, on the side of the limb opposite the



fracture. In the case of fractured fibula, the foot is inclined somewhat inwards, over the fulcrum formed by the thick end of the pad, and by means of the turns of roller passed through the projecting end of the splint. The same apparatus is applied to the fibular side of the limb, for fracture of the lower end of the tibia, with partial inversion of the foot. Fracture of one or more of the metatarsal bones is unattended by displacement, but this injury cannot be inflicted without great contusion of the

soft parts, and ecchymosis. Instant swelling, at first soft, ensues, it becomes hard and painful, the skin is discoloured, purple, blue, and green, the surface is sometimes abraded, and the true skin may even be torn. The elevated position on an inclined plane, made purposely for hospital practice, or on pillows in private, with assiduous fomentation and antiphlogistic treatment, as regards the diet, and condition of the stomach and bowels, continued, will bring about a cure. Mischievous effects arise in all bruises, whether complicated with fracture or not, and in any situation, from leeches, punctures, cold lotions, and stimulating frictions, in the first instance. The blood effused into the cellular tissue cannot be evacuated by leeching, any more than can a coagulum, formed upon or in the substance of the brain, be got rid of by draining the system of blood, as is too often done, by venesection. The blood is to a certainty made to putrefy, if air is admitted to it; the coagulum is dissolved, unhealthy suppuration is established, and the cellular tissue may slough together with the integument. Free incisions will then be required, in order to evacuate the offensive matter and prevent extension of mischief. At a later period, in a case of ecchymosis, means may be employed, though cautiously, to promote absorption of any coagulum that remains.

DISUNITED FRACTURE.

Union of the ends of broken bones takes place very slowly, under some circumstances, and may altogether fail. This depends upon constitutional or local causes, or upon indifferent, careless, or meddlesome treatment. The extremities may be separated from each other, and rounded off; they may be in contact and surrounded by a cyst, formed by condensation of the cellular tissue; or they may overlap considerably, and lie side by side in close apposition, or with some substance interposed.

Various means have been resorted to with a view to set up a process by which consolidation might be brought about. In recent cases, by changing the position of the limb if necessary, and taking great pains to prevent the least movement of the parts,

retaining them in very close and accurate contact by means of splints and bandages, the object may be attained. But it is generally necessary to take means previously to promote a certain degree of excited action. The ends of the bones have been moved about, and rubbed against each other. Incisions have been made, escharotics applied, and portions of the bone have been sawn off in many cases, without much benefit accruing. The chance of success depends a great deal upon the relative position of the ends. If they overlap, and are in contact, the case may be looked upon as favourable. The action of the vessels of the membrane of the bone can be roused, and the best means of doing so is by the introduction of a perforater betwixt the two portions, followed by a strong needle, with an eye near its point, by which a coarse seton is passed in withdrawing it. Of course an opening will be made with a bistoury in the soft parts, close to the bone, taking care to avoid vessels, nerves, or other organs of importance, before the introduction of instruments to disturb and lacerate the deep parts. If the bones do not overlap, and they very generally are so placed, it will be advisable to make the attempt to put them in that position; a short and firm limb being more serviceable than one that dangles about, weak and unsupported by the muscles. This practice has succeeded in the humerus, which, by the way, is the bone most frequently the seat of false joint, in the thigh, fore-arm, and leg. I have had several cases in which the treatment by seton has been followed by a perfectly successful result in the fore-arm, upper-arm, and leg; I have also, as might be expected, had one or two failures, and have besides declined interfering in several instances, on account of the unfavourable circumstances attendant upon them. The plan I have pursued has been to pull about the parts a good deal at first, to introduce a larger and larger cord, and to remove the foreign body at the end of a few days, eight or ten, as soon in fact as a considerable degree of excited action had arisen in the bone and periosteum, and before it has begun to decline; the limb is then put up with great care, and every chance of the slightest motion taking place guarded

against. The object of passing a seton is assuredly not to promote discharge, which is prejudicial to, and often enough when the result of accident, interferes with the union, and gives rise to the necessity for such operations as that now under consideration. This error in judgment and practice seems to have been committed very frequently, as may be seen by a reference to published cases. The following narrative is interesting, and very much to the point under consideration.

Mrs. T., aged 48, presented herself lately at the North London Hospital for advice, and stated that she had received a compound fracture of the left humerus about its middle, from being thrown off a carriage in October, 1833, and was immediately carried to a fashionable hospital. She remained an in-patient only three weeks, being made an out-patient by the house-surgeon, during the absence of his principal from town, at which the latter gentleman was very angry on his return, and to which, more than to anything besides, she attributes the non-union of the fracture.

She continued to visit this hospital, as an out-patient, frequently during six or seven months; the external wound soon healed, and it was then found that the bones had not united. She afterwards became an in-patient, and had the tincture of iodine applied around the upper-arm. Her health began to decline, and she went into the country.

She returned to town, having regained her strength; and in October, 1834, (twelve months after the accident,) underwent the operation of removing the ends of the bones by the saw; she was kept strictly quiet in bed for five or six weeks, when the arm was examined, and the bones found still disunited. She subsequently had inflammation within the chest, and was put under the care of one of the physicians. She recovered from this attack, but remained in the hospital, and in April, 1835, the ends of the bones were "nipped off," and a seton, consisting of a skein of silk, was introduced, which was allowed to remain thirteen months, the silk only being changed once during that period. An apparatus was contrived by which the fore and upper-arms

were retained at a right-angle to each other; the ends of the bones were kept in apposition by means of leathern bands passing from the shoulder to the elbow, and the upper-arm was attached to the side by other bands passing from it to the opposite shoulder, a space being left to dress the upper-arm.

In June last, (1836,) the seton was taken out, and she was recommended to go to Brighton for her health.

She returned to the same hospital ten weeks since. She stated that she was then told that her arm had better be taken off, and that nothing else could be done for her. She was unwilling to submit to amputation, and left three weeks ago. The arm was quite loose, and the muscles wasted, the bones far removed from each other. Any further attempt, under all the circumstances, to force a union was out of the question. An apparatus was now fitted round the pelvis in which the fore-arm rested, so as to enable the poor woman to use her hand.

DISEASES OF BONES.

As the result of deposit of tubercular matter in the cancellated texture, or of slow, and what is denominated scrofulous inflammation and suppuration, ulcerated cavities are formed in the heads of long, and in the substance of short, bones. Occasionally, though more rarely, the flat bones are similarly affected by an ulcerative process. Abscesses are sometimes also met with in the canals of long bones: these may make rapid progress; additional deposit takes place of osseous matter around the cavity, the periosteum becomes more vascular and thick, and even the neighbouring tissues are infiltrated, and altered in appearance, as when bones in the vicinity of a serous or synovial cavity are primarily affected by morbid action. Some of these accumulations of purulent fluid in bones are more indolent; the parietes of the abscesses, or spinæ ventosæ, as they were absurdly enough termed, gradually expand, and they demand surgical interference, more on account of the deformity and lameness attendant upon them, than for constitutional disturbance or painful sensations. Abscesses in bones of an acute

or chronic kind, discharge themselves either externally through openings in the bone, and in the condensed cellular tissues and integument covering them, after a short time, these become rounded off, and form cloacæ and papillæ, as they are termed; or, again, the matter finds its way into a joint, and by its presence there and previously in the immediate vicinity, the cartilages, synovial membrane, and fibrous tissues around, are involved and destroyed.

The anatomical characters and chemical changes, the lactaceous deposit in the recent cavity, the dried porous appearance of the macerated and prepared bone, the conversion of the animal substance into a greasy, fatty matter, must be considered elsewhere. The surgeon will sometimes be called upon to open abscess of bone, by division of the superimposed parts; or even after matter has found its way to the surface, and discharge has long been furnished, it may be found necessary to give freer exit, so as to prevent accumulation, and thus afford a chance of the secretion being gradually diminished, and ultimately arrested by the obliteration of the abnormal cavity. This is effected in some exposed bones, as the tibia, the lower end of the fihula, the great trochanter, or the ulna, readily enough;. the soft parts are divided by means of a strong-pointed bistoury, and the exposed layer of bone removed by the application of the crown of a trephine, of a large or small size, as may be. By the use of a trois quart of proper dimensions, a cloaca, if such exist, may sometimes be sufficiently enlarged, to allow of the object in view being effected. The unhealthy surface of the cavity may be thus removed, or escharotic or other applications made, if it be thought that advantage will arise from the practice. In the cavities of abscesses in the cancellated texture, and sometimes in the shafts of bones, dead fragments, detached or not, are discovered. These may be the consequence or the cause of the abscess, and their removal is sometimes attended with good effects. This is easily accomplished after the external opening has been made sufficiently large, by the introduction and judicious employment of a small scoop, or of forceps suited to the purpose.

Cavities in bones, lined by a secreting membrane, are slower of contracting and healing by much than similar cavities in soft parts. The tissue is endowed with a less degree of vitality or power of reparation, and besides, the elasticity by which the walls of abscesses in soft parts are brought together and closed, does not operate here. I have repeatedly had occasion to trephine the tibia to evacuate matter, or remove small internal sequestræ, and the other day I put my hands on an old note-book, containing a case in which this operation had been performed on the heads of both these bones of the same patient, in the year 1822, with a successful result. I have also been obliged, in some few instances, to apply the trephine to the femur at various points, and there is a case now under my care, in the North London Hospital, in which an abscess on the outer and inferior part of this bone was opened more freely by this means, and a small sequestrum of the cancellated texture removed. The young man was originally a patient of mine, three or four years ago, in the Edinburgh Hospital, and then had presented himself with the view of submitting to amputation of the thigh. A very large sequestrum was removed, comprising more than half the thickness of the shaft. He made a perfect recovery, and had remained well, and able to earn his livelihood until within a few days before his admission to the North London Hospital; a large abscess was then approaching the surface anterior to the outer hamstring; it was opened, and a quantity of most offensive pus evacuated: it was then ascertained, by the introduction of the finger, that the bone, as suspected, was diseased. Some time afterwards, when the tenderness had subsided, an examination was made by a probe. It was supposed both by myself and my excellent house-surgeon, Mr. Watts, from the possibility of passing the instrument on each side of bare and dead bone, that there was a considerable portion of bone so far separated. We were both deceived, however, for on cutting open the soft parts pretty freely, it was soon found that there was merely a cloaca in the shaft, the edge of which was uncovered and in a state of nerosis, but still attached; the crown of the trephine

was applied to this, the opening sufficiently enlarged, and a portion of dead, cancellated texture, probably the cause of the mischief latterly, extracted with some trouble. A curious feature in this case is the shortening of the femur, consequently of the limb, to the extent of nearly three inches, and this certainly, without any fracture of the substitute bone, if dependence is to be placed on a very accurate history; its developement seems to have been so far checked.

The removal of the extremities of bones affected by caries, whether resulting originally from diseased action of their tissue or of the articulating apparatus, remain to be considered in the next chapter. Acute inflammation of bone is often followed by formation of matter on its surface, and under the periosteum; this is sometimes connected with loss of vitality of the external lamellæ; or, again, as the effect of inflammatory action, the result of injury, or the consequence of some vice in the system, a great portion of a bone may perish, the whole thickness of a flat bone to some extent, or the greater part of the shaft of a long bone. The death of a portion of long bone, which is not quite so rapid a process as is generally supposed, is preceded and accompanied by the deposit of new matter on its surface, and under the periosteum, which soon becomes osseous. The intimate structure of the original bone which remains alive, is condensed by interstitial deposit; the dead portion, exfoliation, or sequestrum is gradually separated from the living, and acted upon until it is so detached by ulcerative absorption; hence the worm-eaten appearance that sequestra generally present. Purulent matter is secreted, and finds its way to the surface through the external shell, made up of old and new bone; by-and-bye part of this shell is removed, as the dead bone becomes loose, thus allowing it to reach the surface and be thrown out. This process is occasionally retarded by local circumstances; for instance, the great size and position of the sequestrum; or it may be very slow in consequence of the power of the patient's system being wasted and weakened, by long-continued irritation and discharge.

The surgeon is called upon in all stages of the disease to inter-

fere and assist nature. By active management the inflammation may be arrested, and abscess or necrosis prevented or limited. Great and instant relief may be afforded, and the extension of mischief guarded against, by a timely and free incision, as is seen in the more severe forms of paronychia, whether the bone has been primarily affected or not; again, in an advanced period of the case, the removal of decayed parts, the presence of which always occasions great disturbance, may be effected with advantage. Interference is only admissible, however, when the exfoliation or sequestrum is completely detached by the natural processes. The dead portion of bone may be confined and retained by the soft coverings only, as in the two following cases, to which many more very similar might be added.

Case I.—An old lady came under treatment on account of disease of the cranial bones, accompanied by very profuse and fœtid discharge. Her health was much broken, in consequence of the long-continued drain on her system. The frontal and parietal bones were ascertained, by introduction of a probe through the numerous openings, to be detached from their investing membrane, rough on the surface, and dead. This state of matters was attributed to external injury, the old lady having had the misfortune, on two or three different occasions, to be pitched on her head by the upsetting of carriages; she suffered, in consequence, under inflammation of the coverings of the cranium, and the symptoms, after a time, had been combated by repeated courses of mercury; as a result of the local injuries and the treatment, most extensive death of bones, with shattered constitution, had ensued. After a time the left half of the frontal bone was exposed, by laying two or three of the openings into one, and the slightest possible motion could be perceived on placing an elevator in one of the irregular hollows on the surface, and pushing it pretty firmly; still the exfoliation, completely unconnected with the living parts, remained firmly seated. It was of such a size, that without making most extensive division of the scalp, its edges could not be exposed, and any instrument insinuated in the line of separation for the purpose of raising it; in fact, it was held

on by atmospheric pressure. Satisfied, from the state of the bone, its slight mobility, and the duration of the disease, that such was the case, a screw attached to an old-fashioned perforator, which had been fonnd useful in similar cases, was fixed firmly into the substance of the exfoliation; by pulling it up to a side, one of the edges was detached, and its extraction accomplished without difficulty, and with but trifling pain. The cavity in which this immense exfoliation lay has been filled up by membrane, the discharge has abated much in quantity, loose portions of the parietal bones, and of the other side of the frontal, have been removed, but some very large pieces still remain to be separated.

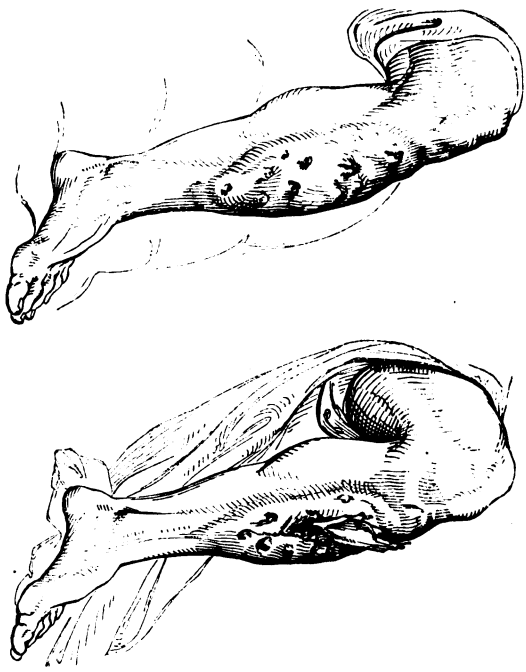
Case II.—A young gentleman of nineteen was presented to me, on account of profuse discharge from an opening in the middle of the right popliteal space, which had continued more or less for between five and six years. His health was bad, he was of small stature, thin, wan, and wrinkled, as if his growth had been stunted. By careful examination with a probe, a large piece of dead bone was discovered; this had been suspected or ascertained long before application was made to me, but it was fainly and vainly enough hoped, that the sequestrum would be removed by the supposed supernatural process of absorption; attempts had been made to promote this; with this view, I presume, the part had been wrapped up most sedulously, from time to time, in plaster, after the skin had been covered by a filthy deobstruent ointment, during a space of nearly two years.

The absurdity of waiting for such a hopeless interposition was pointed out, and the extraction proposed and urged; three or four months elapsed, however, and at length consent was given to the operation. The opening in the ham could not with safety be enlarged: the popliteal space was filled up by infiltration of the cellular tissue, and it would have puzzled any one to say on which side of the opening the nerve, vein, and artery lay. This, by the way, is no uncommon seat of necrosis. The sequestrum is generally thin, and composed of the outer lamellæ of the flat part of the bone, on which the vessels rest; the bone is here not exposed to injury from without, it is, moreover, well covered and

protected by soft parts. Death of bone is here most probably a secondary affection, the consequence of abscess in that mass of fatty matter interposed betwixt the vessels and bone; it is rather a troublesome situation to remove foreign bodies from, the space being limited, and containing important parts. In many cases I have succeeded by enlargement of the original wound, when that has been placed near the one or other hamstring, and when the sequestrum has been small.

In effecting the extraction in a variety of others, the practice pursued in this case has been advantageously followed. The sequestrum was ascertained to be large, and the cavity in which it lay pretty capacious. The point of a strong probe bent and introduced in the ham, could be felt, through great thickness of parts, on the outside of the limb; an incision was here made betwixt the outer hamstring and the femur, the cavity opened, and the dead bone extracted. Six months after, the patient was again brought for advice, much altered for the better, strong, ruddy, and full of flesh; the opening through which the sequestrum was withdrawn, had healed very quickly; the original opening had also dried up for a time, but latterly it had begun to pour out a little discharge. The existence of a small additional bit of loose bone had been detected by a gentleman, who had paid great attention to the case; with some difficulty a piece, about an inch long, ragged and pointed, was seized with a pair of slender bent forceps, and extracted; immediately after, the opening healed up firmly, the cicatrix becoming retracted and permanent.

In cases in which the dead bone has approached the surface, it can be reached, seized, and extracted, by mere division of the soft parts. Cases now and then present, where, by the ulceration of the soft parts, one end of the bone is exposed, as represented in the second of the sketches on the next page, so that it can be laid hold of and extracted in the direction of the shaft, and almost without the use of instruments.



These are sketches from the same case, at different periods, in a lad of seventeen. In the state represented in the first, the existence and the detachment of the sequestrum were ascertained, and by no very severe proceeding, the dead portion could have been exposed, and readily and safely removed; the patient, had he consented, would have been thus saved much pain and long confinement, and the cure would have been abridged by nearly one year; nature in that time accomplished what might have been effected in a very few minutes.

Occasionally when a cloaca is exposed by ulceration or incision, the cavity with which it communicates is found to contain a dead portion of the shaft, which may be made to move readily backwards and forwards, but the middle of the sequestrum can only be got at, the ends cannot possibly be reached or disentangled. In this case more extensive opening of the shell may be resorted to; it may be practicable to gain sufficient room by dividing the interspace of two or several openings in the new envelope of bone, and this is

done readily by the use of a small saw or cutting forceps; again, it may be found necessary to make a perforation or two with a trephine, and lay these into one opening with each other, and with the cloacæ, in order to uncover sufficiently the part to be removed. Though neither end is fully uncovered, the disentanglement may often be achieved by pushing the sequestrum downwards or upwards in its containing cavity; it can then be easily extracted. In other instances, as where the whole thickness of the shaft of a bone has perished to some extent, the substitute bone is imperfect, the middle of the dead portion is fully exposed, and the ends confined, the division of the sequestrum may be performed without pain, and the extraction of the two portions thus accomplished with the happiest effect. Care must be taken, in the removal of the dead bone, not to break up the shell too much which contains it, so as to endanger complete solution of continuity. The instruments for these operations must be well contrived, and efficient in every way as regards their size, strength, and temper. Trephines, Hey's and other small saws, may be required; cutting-pliers, elevators, and sequestra-forceps, not forgetting strong bistouries, complete the apparatus.

The vessels bleed freely, because the condensed state of the cellular tissue prevents their retraction. Ligatures will seldom be necessary for any of them, the same condensed and firm state of parts being favourable for the application of pressure. The cavity is well filled with lint, after the perfect removal of blood: this is retained, and the pressure, if necessary, kept up for some hours by a compress and roller.

CHAPTER IV.

ON INJURIES AND DISEASES OF JOINTS.

SPRAINS.

By force awkwardly applied to a joint, when the muscles are unprepared, or by irregular action of these, the articulating apparatus, the synovial or fibrous capsule, the ligaments, the tendons and their sheath, are often stretched violently or even torn. This is attended with immediate and excruciating pain, and the system often receives a considerable shock in consequence; the patient becomes faint, sick, pale, and often does not rally for some time. Great and instant swelling arises from effusion of blood and serous fluid; there is discoloration, as after bruise, and generally in the course of the tendons on that aspect of the limb opposite to that towards which the joint has been twisted. If the extremity is not disused, inflammatory swelling supervenes; it may, and often does lay the foundation for the disease of the joint. Little else besides rest, and position to relax the injured parts and favour the return of blood, are required, even in the most severe sprain, to bring about a cure. Hot fomentations afford great relief, and after a short time absorption proceeds rapidly; the lesions are repaired, and the motions of the limb restored. Gentle friction and support by an elastic bandage, (those of India-rubber answer admirably, applied over a thin stocking,) may be resorted to with advantage, but not till after the subsidence of all painful feelings, and until the chance of inflammatory action has passed away. If inflammatory action has been encouraged and

roused by imprudent use of the part, or injudicious management, then active antiphlogistic treatment must necessarily be adopted; perhaps even abstraction of blood by venesection may be required; at all events the free and frequent application of leeches must be employed; antimonials and purgatives are exhibited, warm fomentation is continued, the position of the limb being still attended to, and strict rest enjoined.

In recent and slight sprains and bruises, a weak solution of the tincture of arnica montana seems sometimes to afford relief, and to favour the absorption of effused blood. In these injuries, the bad effects of an injudicious and untimely use of stimulating frictions, and cold evaporating lotions, is often observable. The ankle and wrist suffer most frequently from accidental twists; but all the articulations, great and small, may be so affected, the shoulder, hip, elbow, knee; and the latter joint is subject to a subluxation in consequence of the laceration of the internal lateral ligament; the injury is most frequently met with in females, which is attributable to the inclination inwards of the bones of the thigh and leg. It is slow of being recovered from, and support is required for a long period after the accident. A similar injury is met with in the articulations of the phalanges of the fingers, and when at first neglected, it proves very troublesome. A straight and proper position must be preserved, the part put out of use and kept at rest for a considerable time.

Displacement of the articulating extremity of any bone is immediately followed by change in the shape and contour of the limb, by alteration in its length, and by marked abridgment of its motions; complete luxation cannot occur without laceration of the capsular ligament to some extent, and very generally there is considerable lesion of the surrounding muscles or tendons. Dislocation is the result of irregular action of the muscles, or of force applied to the distal extremity of a bone, either immediately or mediately. The diagnosis betwixt bruise of muscles, sprain, fracture, and dislocation, is sometimes attended with a little difficulty, and this difficulty is always increased by delaying the examination. In the first instance, before great effusion has taken place,

and more especially before inflammatory swelling has come on, the injured part can be well observed and manipulated; the change in its form can be perceived, the position of parts, and the extent of motion ascertained, and the existence, or not, of crepitation satisfactorily made out; all this is, at the proper period, effected with comparatively slight suffering to the patient; at a later stage the signs are obscured, and every motion and attempt at it is productive of the most lively and excruciating pain. A correct notion of the state of the injured parts must, however, in all cases, be come to, for the sake of the patient's future welfare, as well as for the surgeon's reputation. The existence of luxation being ascertained, common sense will point out the propriety of immediate reduction, and this can never be effected with such facility, as it can on the spot where the accident has happened, whilst the patient is yet low and weak from the shock, his muscles all relaxed, and unprepared to resist. The shoulder, and even the hip-joints, are easily reduced, as in the hunting-field, in these favourable circumstances and even by unprofessional persons. The longer, generally speaking, the period that is allowed to elapse, betwixt the occurrence of the accident and the attempt at replacement, the greater will be the suffering of the patient, and the trouble and difficulty encountered by the surgeon. Advantage will always be derived, and should be taken, in cases where difficulty of reduction is anticipated, by putting the patient off his guard, and placing him in such a position as to prevent his muscles from acting powerfully in opposition to our efforts. The patient should be kept in conversation; and he may be nauseated, or weakened for the time, by the exhibition of antimony, by the employment of tobacco in various ways, by bleeding, or by the use of the warm-bath; the muscles can be tired out, though not without much agony, by being kept long on the stretch, as by pullies or by a screw; this is only called for, and resorted to, in the reduction of luxations of the larger articulations, and especially of those of long standing. The degree of force thus applied, must be duly and prudently regulated, otherwise much mischief and danger may arise.

Fracture of bones, laceration of muscles, of nerves, causing permanent paralysis, or of arteries, giving rise to aneurysm, have been the results of the employment of unwarrantable and forcible extension. It would be better to leave any joint unreduced, than subject a patient to such pain and hazard. An unreduced dislocation renders a limb unserviceable for a time, but by-and-by such alterations take place in the form of the bones, in the attachment of the muscles, and in their actions, as to allow the member to be again brought into use. The muscles which had shrunk away through inaction, become again developed, and the patient shortly feels but little inconvenience; efforts at reduction can only be made with propriety, and with any chance of success in some luxations, at an early period. In others, the bones may, and have been, replaced at the end of many weeks, or even months. The date of the accident, the form and nature of the joint, the age of the patient, and his occupation, will influence the surgeon very much in his determination to attempt the reduction or not.

Luxation of the jaw can take place only in one direction, forwards, the condyles being thrown into the temporal fossæ, and this generally arises from irregular muscular action. One or both condyles may be displaced; if one only, the chin is twisted, the motions limited, and the mouth a little opened. If both have escaped from their articulations, the fixed, open state of the mouth, and projection of the chin, will leave no doubt even in the mind of one not much experienced, as to the true nature of the accident. Assistance is early sought, and the reduction is seldom a matter of much difficulty. The thumbs of the operator are protected by thick gloves, or the folds of a handkerchief, or napkin, placed upon the molares, whilst the fingers embrace the base of the jaw and symphysis. By thus depressing the condyles, and at the same time raising the chin, the articulating processes are suddenly acted upon, and drawn into their normal situation.

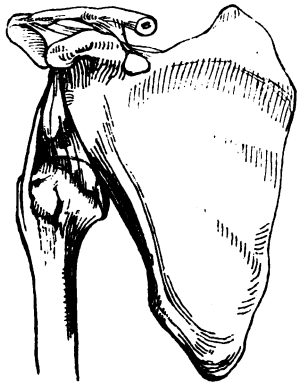
Luxation of the clavicle occurs at either extremity; that of the sternal end is not frequent, and it is easily recognised. Both may arise from force applied to the point of the shoulder; the

sternal end of the clavicle, when its ligaments are torn, projects forwards, is replaced without difficulty, but cannot readily be retained in situ. I have not seen luxation here in any other direction than forwards, and a little upwards. The extent to which the scapular extremity is displaced, depends upon the degree of laceration of its connexions. If the ligaments connecting the bone to the coracoid process be torn, as well as those at its termination, then there can be no misconception of the case. The arm falls to the side, and the projection and riding of the bones is quite apparent. The reduction is accomplished by raising the arm, and removing it from the side, and an attempt may be made to retain the parts in apposition, by the employment of the bandage above directed, and delineated at p. 62, in treating of fractures in this situation; this is also applicable in the first-mentioned luxation. In either of these injuries, difficulty of preserving the parts in their natural situation will always be experienced, and the cure is slow and imperfect. The bone, however, in time contracts adhesions, and the limb regains its power and mobility.

The head of the humerus is perhaps more frequently luxated than any other bone; nor can we be surprised at this circumstance, when we look at its free and extensive motions, and the shallowness of the cavity on which it rests. The displacement takes place from falling with the arm extended, and abducted; and the head of the bone is forced out of its socket, or drawn from it, by the muscular action, either downwards or forwards. It rests on the inner edge of the inferior costa of the scapula, as represented on the next page, or under the coracoid process. It may occupy some intermediate position; occasionally, though very rarely, the head of the bone is displaced backwards, and lies under the spine of the scapula. I have seen but one such case; two only are mentioned by our great authority on the subject, Sir A. Cooper.

The capsular ligament is rent in all complete luxations; the fibres of the subscapularis are torn and separated, the bone being pushed through them, either towards the upper or lower margin of the muscle as seen in the second of the sketches on the next page, taken from the dissection of a very old displacement of the

muscle. The fibres of the supra and infra spinatus are stretched, the long head of the biceps is displaced, and its sheath lacerated.



The patient suffers great pain, more especially if the dislocation is into the axilla. The limb is benumbed, and soon becomes distended and swollen, owing to the pressure on the plexus of nerves and axillary vein. In all forms of this injury, there is a remarkable flattening to be observed under the acromion. The limb is fixed, and unless through the motions of the scapula, which soon become much more free than in the normal state, it is impossible to abduct or bend the upper-arm to any extent, in relation to the chest, and the elbow projects from the side. In the luxation downwards, the limb is elongated, the elongation being striking and apparent; it can be ascertained exactly by measurement from the point of the acromion to that of the elbow. In the luxation forwards, the limb appears somewhat shortened, the elbow is projected outwards, and backwards. The head of the bone can be felt by careful examination, in any of the new positions which it occupies; the arm must be removed as much as possible from the side, by grasping the elbow, whilst the fingers of one hand are passed into the axilla. The head of the bone can be seen and felt on the inferior and mesial aspect

of the coracoid process before swelling has occurred, and in old luxations, after its subsidence. The history of the accident, the immobility of the limb, and a careful examination, will, in all recent cases, guard the practitioner against error in diagnosis.

The difficulties increase in proportion to the delay in the examination. At the end of some weeks, whatever the injury has been, whether fracture or luxation, the immobility of the limb will be the same, and no conclusion can be come to in consequence of the absence of crepitation; a careful examination of the head of the bone, and its relations, with attention to the history of the case, can alone be relied upon. In very recent cases, a considerable obstacle to reduction seems often to arise from the state of the capsular ligament; the rent may embrace the neck of the bone, and very frequently, further laceration may be felt to occur in its return to the glenoid cavity. The action of certain muscles, more especially the deltoid, supra spinatus, and biceps, will, after a time, be opposed to the removal of the head of the bone, more especially from the axilla. If difficulty is experienced, the limb must be placed so as to relax these as much as possible, and favour reduction. It must be abducted, whilst the fore-arm is bent; and this position of the fore-arm is besides advantageous, as affording the means of performing rotation, by which the bone is often brought into a position favourable to its return by the muscles into its proper place. In most cases the surgeon may succeed in his object without assistance, for he can make both extension and counter-extension readily enough. He may seat the patient in a chair; he then rests his foot on the seat, and places the luxated arm over his knee; he abducts the arm well, and using the humerus as a lever, he extends the limb; then raising the head of the bone, he brings it into such a position as to permit it to slip back into the glenoid cavity. The reduction is perhaps better managed, however, by placing the patient in a recumbent position; the surgeon makes counter-extension by placing his heel, (having of course pulled off his boot,) in the axilla of the displaced arm, whilst he makes extension by grasping the wrist with both hands. If difficulty

be felt, the extension should be made from above the elbow, by means of a jack-towel passed round and secured by a clove hitch, as represented p. 113, in treating of luxation of the thumb. By turning the patient a little to the sound side, the extension can be made backwards and outwards. Should either or both of these means fail, the patient may be seated on the floor, whilst a strong assistant grasps him in such a way as to fix the scapula. The surgeon places himself on the other side, and adjusts his feet so as to meet those of the assistant on the opposite side; he then makes continued extension by means of a towel or lacque, secured above the elbow. In cases in which unsuccessful attempts have been made, or in which difficulty in effecting reduction is anticipated in consequence of the great muscular power of the individual, or the period that has been allowed to elapse betwixt the accident and the proposed attempt, it will be prudent, on the part of the surgeon, to provide means for keeping up powerful extension, with the view of tiring out the muscles. Several assistants may be employed to make extension, whilst the patient is fixed; for which purpose a broad belt of canvass or leather is used with advantage; the arm is passed through a suitable opening in it, and this is made to embrace and fix the scapula by a few straps and buckles. The ends of this surcingle are secured to some immovable point. The extension by assistants is not so steady as that by mechanical means; pullies are accordingly used in general, by which a steady and certain extension can be made and maintained. These are attached, by a hook, to a band passed round the lower end of the upper-arm, on one side, and to a ring fixed in the floor or wall. Before applying the lacque to the arm, it is advisable to protect it as far as possible from bruising, or abrasion of surface; a damp towel answers the purpose, and does not readily slip. Rotation can at the same time be resorted to by means of the bent fore-arm, and at the same time by passing a towel under the head of the bone, attempts may be made to alter its position during the extension.

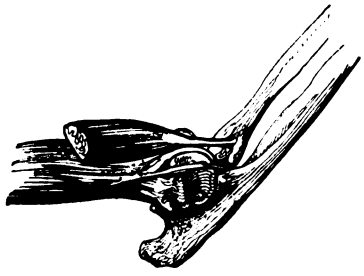
The auxiliary means already noticed at p. 100 may, moreover,

be resorted to. In luxations of many weeks' standing, the chance of success and failure must be well weighed; the patient must be made aware how these chances stand, and of the pain and risk to which he must be subjected in the attempt; his situation in life must be looked to, and his feelings in the matter understood. If an attempt is thought advisable and entered upon, the judgment and prudence of the surgeon must be exerted in deciding upon the degree of force and duration of the operation; he must neither abandon his efforts to restore the limb to its original state, so long as a fair chance of success presents itself, nor must he heedlessly persist in using violence which may possibly endanger the patient's life. It is impossible to lay down any general rule on this subject; it has been proposed to employ a dynamometer to measure the degree of extension, but the force must be varied according to circumstances, the age, sex, and muscular power of the unfortunate patient: in fact, reliance must be placed in the skill and judgment and conscientiousness of the practitioner, in this, as in all other surgical cases.

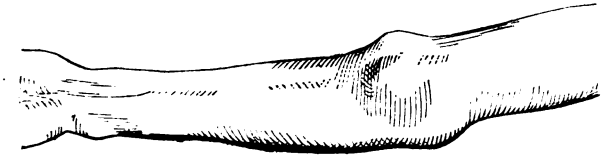
After the reduction of a luxated humerus is accomplished, it is advisable to place a small pad in the axilla, and to secure the arm to the side for a few days by the turns of a broad roller. Luxation is apt to occur again and again in the same joint, but more so at some distant period; the stiffness and pain will at first render the patient anxious to preserve the limb at rest, and not to expose it to the risk of fresh injury. The precaution of fixing the arm can do no harm however; on the contrary, the more steady it is preserved, the more rapid will be the absorption of bloody effusion, the subsidence of pain, and restoration of its functions. Warm fomentations may be used with relief and benefit.

Luxation of the radius and ulna is even a more common occurrence in young subjects, than the injury which we have left the consideration of. It is often overlooked, misunderstood or neglected, until the time has passed over at which the reduction can with safety and success be attempted. The most common dislocation is that in which both bones, still connected by their interosseous and orbicular ligaments, escape from their situation, and

are drawn backwards on the posterior surface of the os humeri. The coronoid process is received by the fossa, from which the olecranon has been dislodged; the capsular ligament is torn on the fore part, and the fibres of the biceps and brachialis are put



upon the stretch, and often considerably lacerated; this occurs very readily before the articulating processes are fully developed, and whilst the ligaments are yet yielding, through wrenches of the limb, or force applied to the further extremities of the bones, as in falls on the palm, the fore-arm not being fully extended. The limb is fixed in a slightly bent position, and it is much deformed and shortened; the olecranon process, by comparing it with the condyles, instead of being rather on the distal side of a line drawn from their apices across the back of the elbow, is found to be placed much higher, the head of the radius can be felt to move on the posterior surface of the outer condyle, on performing rotation, which is imperfect; the articulating extremity of the humerus projects on the fore part, and its depressions and eminences can be distinctly felt and seen, before the swelling has supervened, or after the parts have become quiet, and when the luxation is irreducible; this period very soon arrives even in



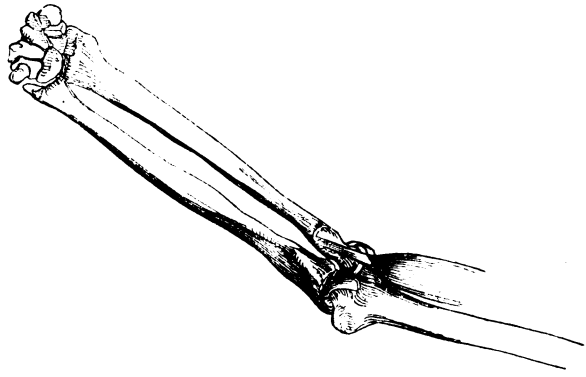
young patients, and in adults in whom the injury is by no means very infrequent, the obstacles to reduction are greater, the processes and depressions of the bones being more defined, the ligaments more rigid, and the muscles more powerful; within a few hours, or even within a few days, and before the bones have become well settled in their new position, reduction can be readily enough accomplished; within a fortnight, I have often succeeded without much difficulty. In a few instances success has followed the efforts at reduction about three weeks after the occurrence of the injury, and perhaps a few days later; but in several cases of longer standing, and at different ages, in males as well as females, I have tried and assisted in attempts to reduce the bones; nothing was left undone in the way of preparation, in the extent and direction of the force, but all in vain. The joint could be loosened, but the coronoid process could not, by any effort, be made to slip over the end of the humerus. Seeing the difficulty of reduction, and the risk that may in young patients arise from the pulling and twisting of the articulating apparatus, the possibility in some delicate habits of inducing disease of the synovial membrane, it behoves the young practitioner to make a most careful examination of the effects of accidental violence in this situation, and to make up his mind early upon the exact circumstances and the correct mode of proceeding. That should be forthwith adopted without hesitation or delay, were it for no other object than to relieve the patient from pain and apprehension. The plan usually recommended and followed by the best authorities, is to bend forcibly and with as long a lever as possible, the forearm upon the upper arm, by grasping them and at the same time placing the knee on the fore part of the joint, as one would try to snap a rod over it; or it is recommended to bend the joint by placing the fore part of the arm against a bedpost or the back of a chair, and by then acting upon the wrist; in this way success may be obtained in recent cases, but I have seen this plan tried again and again in vain. Were force applied thus suddenly and violently, there is a possibility of separating the olecranon process. A better mode of proceeding, in my opinion,

and one which I have successfully pursued in numerous instances, for the last twenty years, is to extend the humerus upon the scapula, and the forearm upon the humerus as much as possible, the patient being seated on a chair, and the limb brought behind him. The surgeon then makes extension by grasping the wrist with one hand, and counter-extension with his other placed against the posterior aspect of the scapula, the thumb resting in the axilla; or the patient may be placed prone on a mattrass, the extension being then made upon the limb pulled behind the him with both hands, whilst counter-extension is effected by the foot placed against the inferior costa of the scapula, or by assistants holding a jack-towel passed under the axilla.

In very difficult cases, the pullies may be used, the direction of the force being the same as already indicated. The return of the bones into their normal relations will at once be ascertained by the change of form which the joint assumes, whilst the ends of the bones may be felt gliding over one another, and by the facility of afterwards bending the fore-arm to any extent. Displacement of both bones laterally is met with, though rarely, the olecranon process being placed upon the outer or inner condyle, in which latter case, the head of the radius rests in the fossa, on the posterior aspect of the humerus. In all the luxations of the elbow an unnatural degree of lateral motion is permitted.

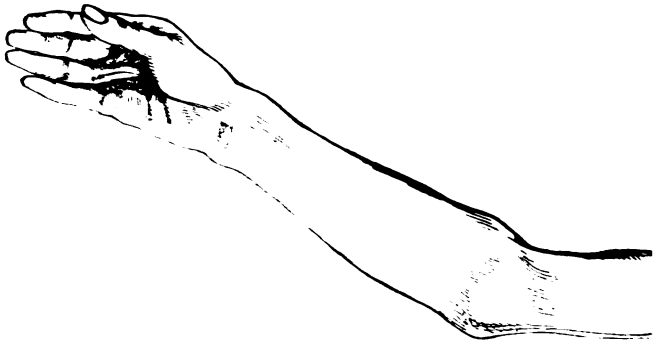
The same care in the first examination of the joint is advisable to insure a proper line of proceeding, and the same promptness in pursuing that line is requisite; the proceeding is little varied, the direction in which the extension should be made being the same, but some lateral pressure upon the ends of the bones may be resorted to, in order to secure their proper adaptation. The ulna has been displaced so far without the radius following; and this may happen through fracture of the coronoid process; the radius is again dislocated without the ulna leaving its natural position, and this displacement occurs either backwards or forwards upon the outer condyle. The former is rare; I can recal to my recollection but one case, which occurred in a lad brought to the Edinburgh Royal Infirmary many years ago; the luxation forwards is more common. In either case the orbicular ligament and inter-osse-

ous must be torn, and the end of the bone is drawn farther from its situation by the action of the biceps, when the fore-arm is extended thus.



The reduction of luxation backwards, is effected by making extension from the hand, and at the same time bringing the limb into the prone position. In that forwards, the bent and supine position is to be preferred, so as to relax the biceps, whilst by grasping the hand extension is made, and the head of the bone is pressed into its place. A pad should be placed in the bend of the arm, and this, as well as the position, secured for some weeks, so as to afford time and opportunity for the reparation of the injury to the ligaments.

Many of these luxations are left unreduced from one cause or another, but, on that account, most fortunately, the functions of the limb are not destroyed. For a time, the motions are retarded and weak; gradually, however, and often most unaccountably, the bones and muscles get accommodated to the change of circumstances. In the unreduced dislocation of both bones backwards, the olecranon process becomes shortened, a new articulating surface is formed anterior to the coronoid, and, after a time, the motions become extensive. The fore-arm can be bent at right angles, or even farther, the limb becomes strong, and nearly as useful as if no injury had been inflicted. In the dislocation of the radius forwards, where, at first, the limb is fixed in the extended position, flexion comes to be performed almost to the full extent.



The accompanying sketch is from the arm of a lad who, eight years previously, had met with this injury. The signs are well marked, the projection caused by the rising of the end of the bones in the extended position, and the hollow behind. The degree to which flexion could be performed in this case was very remarkable; the fingers could be placed on the point of the shoulder, and this took place without much change in the position of the radius. The bone seemed to be somewhat shortened, and the form of its head changed.

Dislocations of the wrist are but of rare occurrence. Fracture of the distal end of the radius, and swelling, from effusion of blood in the sheaths of the tendons and under the fascia, must not be mistaken for this injury. The carpal bones may, by the application of great force to the palm or dorsum of the hand, be forced from their situation, and may rest on the anterior or posterior aspect of the bones of the fore-arm; the reduction is not a difficult matter, extension being made, with pressure on the projecting bones.

Dislocation of the phalanges of the fingers is easily recognised. It cannot be produced unless by the application of great force, as in the following case.

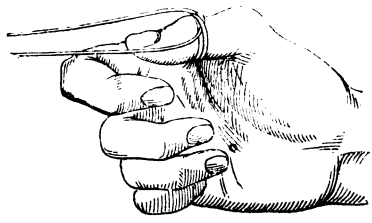
Mr. C., one of our most attentive pupils at the hospital, in catching a heavy iron ball, which fell from a height, and had thus acquired great velocity, dislocated the middle

finger of the right hand at the second joint. The ball was principally received on the palmar aspect of the distal phalanx; this was forced violently back, and the head of the middle one was thrust forwards on the anterior aspect of the proximal, probably betwixt the lateral ligaments, without much laceration. It was reduced immediately, and without difficulty. These displacements are readily remedied, the only difficulty being in procuring the means of extension; a small cord may, however, with care and neatness, be fixed with a clove hitch close to the apex of the finger, should difficulty be experienced. The reduction of luxation of the proximal phalanx of the thumb, on the posterior aspect of the metacarpal bones, has occasionally been found puzzling enough, and it is never accomplished without some little trouble. This difficulty has been attributed to the action of the short flexor, and to the tight embrace of the lateral ligament round the neck of the bone. By making the extension across the palm of the hand, the one obstacle is done away with; but the strength and rigidity of the ligaments are not in general easily overcome. Before the reduction has been effected, it has been found necessary to divide one of the ligaments; the external is most easily reached and divided by the introduction of a narrow-bladed knife (such a one as is used by some practitioners of surgery for exploring tumours) through the skin at some distance, and by directing its edge against the resisting part.

In the "Elements of Surgery" I have related one case of a very old man, much intoxicated, in which it was found absolutely necessary to perform this operation before the reduction could be accomplished; and shortly before giving up the charge of the Edinburgh Hospital, a lad, under fifteen years of age, was admitted with luxation of this joint of nearly fourteen days' duration, so far as I can recollect. In his case it was impossible to effect the replacement until the ligament had been divided. He returned within a week, having again fallen and displaced the bones. The reduction was on the second occasion made readily enough.

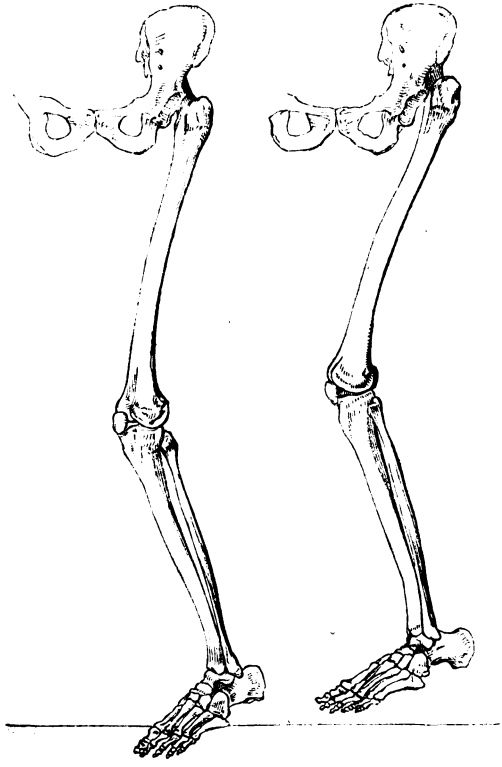
The appearance of the joint in its abnormal position, and the application of the hitch or noose so often spoken of, are shown

in the accompanying sketch. In order to make effectual counter-



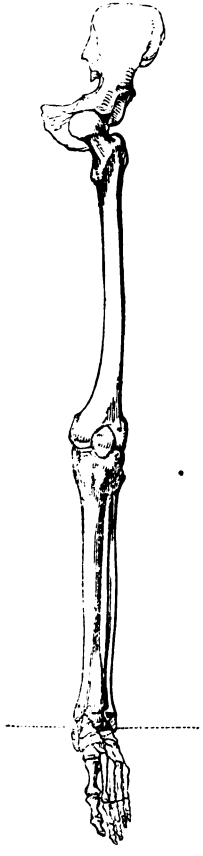
extension, a handkerchief should be passed under the metacarpal bone, and attached to some fixed point.

Displacement of the head of the femur takes place in four different directions, as shown in the plans annexed. The most



common is attended with marked shortening of the limb, to the extent of from one to nearly three inches, with inversion of the toes, as represented in the plan on the right of the last page. The head of the bone rests on the dorsum of the ileum, behind and above the edge of the acetabulum. The capsular and round ligaments are torn; all the muscles are disarranged in their positions and actions; the quadratus gemelli and external obturator are overstretched; whilst others, the pectineus, pyriformis, the glutæi and triceps, are relaxed, and these latter are supposed principally to oppose efforts at reduction. The knee of the affected side, slightly bent, lies over the opposite thigh, and cannot be far removed from it; indeed, abduction of the limb to any extent is impossible. The trochanter major is depressed, but unless the patient is very corpulent and muscular, or the parts are loaded with effused blood, the head of the bone can be distinctly felt, more especially when rotatory motion is attempted. Luxation, in this situation, is occasioned by force applied to the lower end of the bone, as by the limb being bent under a person, and to the opposite side. Fracture of the upper part of the bone, through the neck or trochanter, as has already been noticed, may be attended with inversion, and may, by a superficial observer, be mistaken for this luxation; but the history of the case, the greater mobility, the prominence of the trochanter, and, above all, the crepitation, will lead the surgeon to a correct diagnosis. Reduction may be accomplished immediately after the occurrence of the luxation, with scarcely any extension, and almost without assistance. In a few hours, however, when swelling, great stiffness, and pain have come on, difficulty must be anticipated, and means provided to fix the pelvis and make steady extension of the limb. A band should be placed in the perineum—a folded sheet will answer the purpose—and this is fixed to a staple or ring: a towel is passed under the two sides of the band, and fixed over the os innominatum of the injured side. A lacque is then fixed, as directed in speaking of the corresponding luxation of the upper extremity, above the knee, or, what is better, a metal ring, well padded, and tightened by a screw, or a strong leather belt, fitted with straps and

buckles, is thus well secured; the pullies are attached, and the extension made downwards and forwards, steadily and gradually; after this is continued, (and it may be well, in cases of some standing, to have the patient prepared, lowered, and relaxed by nauseating medicines,) so as to tire out the muscles and diminish their resistance, rotation outwards should be performed by laying hold of the ankle, the leg having been kept nearly half bent, during the progress of the extension. This manœuvre will often succeed at once, after the muscles have begun to yield, the head of the bone has shifted its position and has come nearly opposite the acetabulum. The return of the bone is generally first noticed by the patient, unless indeed it goes in with a loud snap; this, however, is not to be expected in cases of some standing, after the extension has been long persevered in, as it must be, and the muscles thus incapacitated from powerful exertion, as must be the case when the reduction is attended with great trouble, and only accomplished by long-continued and patient efforts.

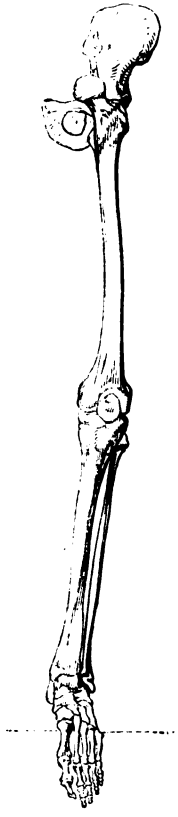


The head of the femur is apt to slip over the acetabulum, with great attendant laceration of the ligaments, and to lodge in the thyroid foramen, in consequence of violent abduction of the limb, as by a fall under a weight, with the legs spread. The extremity is longer than the sound one, by an inch and a half or two inches, the foot is not turned to either side, the trochanter is much depressed, and the limb cannot be carried towards the other. The body is bent forwards, in consequence of the psoas and iliacus being put upon the stretch. In thin persons, the head of the bone may be felt towards the perineum; elongation of

the limb cannot take place from any other injury, though it may appear to be lengthened, as in consequence of bruising of the muscles about the hip, and in this case there is always considerable eversion. In detachment of the trochanter major, a rare case, a degree of falling downwards of the limb occurs; but this arises from a different sort of accident, and the cause can be recognized. The first stage of hip-joint disease, more especially if the patient has met with any recent injury, is apt to be mistaken for luxation downwards, the limb appears elongated, the hip flattened, the motions abridged; but the whole member is wasted, the trochanter is prominent, and motions of the joint can be effected in every direction, but with pain; there is no difficulty in performing adduction. The previous state of the limb must be inquired into, when any doubt exists; for the adoption of the means of reduction of a supposed luxation would be most mischievous in any stage of morbus coxarius.

The reduction of dislocation into the obturator foramen is effected by powerful adduction; but it is advisable to fix the pelvis by the perineal lacque, and it will be requisite to weary the muscles by extension with the pullies, when the injury is of some standing; the forcible pulling of one limb over the other is to be depended upon for success. Sir A. Cooper has properly cautioned practitioners against carrying the limb forwards, in case the head of the bone should slip back and be received into the ischiatic notch, from which it cannot be displaced. With this caution fully impressed upon my mind, and acting in conformity with the rules laid down by Sir A., in a case of only a few hours' standing, but in a young and powerful man, and where great difficulty was experienced, this accident did occur; but the muscles being well fatigued, I had no difficulty in lifting the head of the bone out of its new situation. The man had so far recovered, in a few weeks, that he left his former line of life, that of a miller, and was enlisted as a soldier.

Dislocation upwards and forwards, the head of the bone resting on the pubes against the ligament of Poupart, and outside of the femoral vessels, occurs, so far as can be made out, from patients, though it is no easy matter for a person who suffers a severe in-



jury, who is instantly subjected to great pain, who is rendered faint and sick, to give a very exact account of the attendant circumstances,) in consequence of violent abduction or rotation outwards of the limb. The appearance produced by the round head of the bone near the surface, and in the situation indicated, will decide at once the nature of the case the surgeon has to deal with. There is some slight shortening of the limb and eversion of the toes; extension backwards and rotation of the limb inwards, are the means of reduction.

Dislocation on the dorsum ilei is of all other accidents of the kind the most frequent, though by no means so much so as fracture near the hip, seeing that for one case of luxation of the hip in any direction, the practitioner may expect to have presented to him at least twenty fractures; next to this, so far as I have seen, the two other luxations shortly described, are almost of equal frequency. Sir A. Cooper, whose field of observation has been very great, and whose admirable work will long be referred to for correct information on this subject, previously but imperfectly understood, has mentioned the luxation into the sacro ischiatic foramen as the next most common form to that on the dorsum. Of the three others I have witnessed a pretty considerable number of instances, of this last only the one already alluded to, and that was secondary. This luxation, Sir A. Cooper states, is both difficult to detect and to treat. In the displacement backwards, as represented in the figure, p. 113, to the left, the limb is shortened, but not to so great an extent as in that backwards and upwards, nor is the foot so much turned inwards. There is a great depression in the situation of the trochanter major, and the head

of the bone cannot be felt. The extension is made forwards, the pelvis being bent upon the thigh by position of the trunk. In this and in some others of the luxations of the hip, power must be applied across the axis of the bone, in order to lift the head out of its unnatural position, and to bring it on a level with the cotyloid cavity, so that it may come within the sphere of action of such muscles as may pull it into its proper place. This is best effected by passing a jack-towel under the top of the thigh, close to the perineum, tying the ends of it together, and passing the loop over an assistant's neck; he is able by raising himself to act very strongly on the bone, or an assistant may be placed on a table or chair to pull at a band so placed.

The patella is displaced to one or other side, more frequently outwards. To admit of the bone resting on the outer condyle, on its fibular aspect, the fibrous capsule must be weak and relaxed, or part of it must give way. I have had a variety of these accidents under treatment in private and hospital practice, but when I have seen the case the bones have occupied their normal position; the patella has slipped back of itself, or the patient states that he has pushed it into its place, or the dresser or house-surgeon has effected the reduction. When I was a house-surgeon—and I had the opportunity of occupying the latter situation in a large hospital for about two years—I never had the luck to be called upon to perform the good office of reducing a patella for any patient. Young anatomists and surgeons meet with anomalies and a vast number of extraordinary cases; they also re-discover many things.

Lateral luxation of the knee pan no doubt does occur, but not so frequently as is said; the bone falls downwards when the tendon of the extensors is torn, or rather when separation of the muscular from the tendinous part takes place; and it would be drawn upwards were the ligament of the patella to be torn across. Of the former solution of continuity I have witnessed several instances, of the latter only one, though I have been taken to see other cases in which it was supposed to have occurred. It may happen that the ligament of the patella gives way rather than

the bone, which is certainly the weaker structure of the two. This rare case I saw a few days ago through the kindness of my friend, Mr. Fisher, of Argyll Street. It happened to one of the police-force, of which Mr. F. has the medical and surgical superintendence. The man, of middle age and muscular, was assisting to convey a prisoner to the station-house, when in struggling he was thrown on his back with his right leg bent back under him; the entire bone was found drawn up on the fore part of the thigh fully three inches, even when the leg was extended; by placing the limb on an inclined plane, applying a bandage lightly so as to retain a pasteboard splint on the popliteal aspect of the bone, Mr. F. had brought the parts into their natural situation, and the case seemed to be going on very favourably.

These displacements are to be restored by relaxing the quadriceps, the leg is extended and the thigh bent; if the reduction does not follow, slight pressure, in the proper direction, will be followed by the desired effect. Partial displacement of the tibia from the end of the femur, with laceration of the fibrous capsule and lateral ligaments, is met with occasionally, and by position and rest may after a time be perfectly recovered from. Perfect luxation of the bones of the leg backwards, or to either side, is attended with terrible laceration of parts and extensive extravasation of blood; reduction is not difficult, but the after-consequences of the injury are to be dreaded. The luxation is sometimes compound, and if there is great injury besides, perhaps amputation should at once be resorted to. Extensive wound of this joint, as in compound fracture of the patella, and even wound with displacement of the tibia and fibula, have, however, been recovered from without loss of the limb.

Luxation of the ankle occurs in four directions, two of which necessarily attended with fracture, have already been fully noticed. The foot, the bones of the tarsus remaining in connexion with each other, is sometimes displaced backwards, the end of the tibia resting on the navicular bone, the heel elongated, the instep abridged. Again, the foot may be pushed forwards, the bones of the leg embracing and resting upon the calcaneum, the posterior

surface of the tibia in contact with the tendo achillis; the foot is remarkably elongated, and the heel has disappeared; very generally, splitting of the tibia and fibula, or fracture of their processes, is found to have happened at the same time. Some forcible extension will sometimes be required whilst the bones of the leg are fixed, before the tarsus can again be pushed into proper form. When there is a fracture, and an inclination to after-displacement, the parts must be secured aright by one or more splints, or the limb may be laid in the apparatus described and delineated page 83 and 84.

The astragalus is sometimes torn from its attachment and pushed backwards, so as to lie betwixt the tibia and tendo achillis. A case of this kind is related in the "Elements of Surgery," vol. iii. p. 348. This bone is now and then, after violent wrenches of the foot, found lying on the fore part, and sometimes turned over upon itself, so that the aspect which articulated with the os calcis presents upwards. These luxations are either simple or compound; this displacement of the astragalus often accompanies breaking up of the other bones entering into the composition of the ankle joint, with extensive laceration of the soft parts, ligaments, tendons, and integuments. The astragalus is perhaps almost completely detached from all the neighbouring parts, or it is broken; or, again, its connexions with the os calcis and os naviculare are separated, and it is thrown out of the wound along with the tibia and fibula; one or other of these bones, or both, are broken in some of the accidents under consideration, and very often the protruded parts still further suffer by contact with foreign bodies.

The complete displacement contrary to what does, and might be expected to happen from, an examination of the relations and strong connexions of the parts, may, it would appear, occur without fracture of the bones either of the leg or tarsus. The most implicit confidence may be placed in the accuracy and discrimination of Mr. Duncan, who admitted and has described the following case, reported in the Lancet, vol. ii. 1834—35, p. 650.

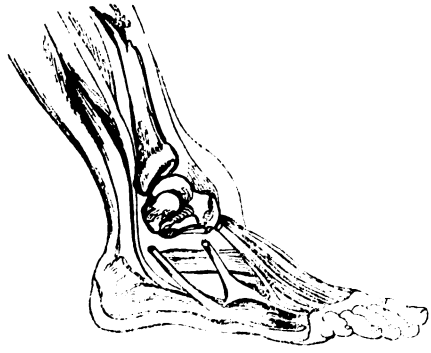
"William Broughton, ætat. 21, was admitted July 16th, under

the care of Mr. Liston. He was one of the men who were working in a tunnel of the London and Birmingham Railway, when a heavy load of clay fell upon the labourers; he observed the mass of earth giving way, and attempted to retreat, but in doing so his foot got entangled under one of the sleepers of the railway, and he was crushed. When brought into the hospital he was in a state of collapse; the skin was rather cold, and covered with a copious sweat; both thighs were much contused about the middle and upper parts; the right was much swelled on the outer side, where there was a small wound of some depth which admitted the little finger; there was a transverse wound about three inches long, which exposed the cavity of the joint over the external malleolus, which projected about one inch and a-half; the foot was very much inverted, and was placed almost at right angles; the internal malleolus on the inner side of the astragalus, and the articular surface of this bone were seen through the wound. After a most careful examination by Mr. Duncan, the house-surgeon, no fracture could be detected. The dislocation was very easily reduced by extending the foot and everting it; it was then put upon a splint; and as soon as the oozing from the wound had ceased, the edges were approximated by isinglass plaster." The poor fellow made a perfect recovery.

Compound luxation may occur in any of the four directions indicated, but generally to the inner or outer side. It is often caused by a fall from a height, more generally by a leap from a carriage in rapid motion. The foot being first arrested, the direction and nature of the luxation and fractures will depend upon the position of the person, and the foot upon which he alights. If he leaps from the off-side of a carriage, and the right foot comes first in contact with the ground, the rent in the soft parts will be on the inner side, the tibia will be protruded singly, or with other bones, and almost certainly with some of them; again, if the left foot is first stopped in its progress, the bones will appear through an opening on the outer side. The injury is generally the result of very great violence, but occasionally it is produced by apparently trifling accidents.

One of the worst cases I have seen happened to an old publican, in a state of intoxication, merely, it was said, by his falling out of bed; it certainly happened in his bed-room, where I found him with a pool of blood round his injured limb. The displacement must be immediately reduced, the wound put together as nearly as possible, and lightly covered; the state of the ends of the bones may render it advisable to remove some portion of them whilst protruded, by means of an amputating-saw, and before any attempt at adjustment has been made; the whole or part of the astragalus may, if much disconnected from parts around, be taken away, by separating its remaining connexions with a knife or scissors: the reduction will then be very readily effected, and generally less difficulty in managing the case is felt throughout when it becomes necessary to remove portions of the bones, than otherwise; there is less swelling and tension, the parts are more easily retained, and with less pain to the patient.

When the bones are comparatively uninjured, neither bruised nor comminuted, the question of removing any part of them cannot be entertained; the limb is placed on the apparatus represented at p. 83, as are all fractures of the leg, simple and compound, excepting only such slight ones of one or other of the bones near their distal end, the treatment of which accidents has already been pointed out. The progress of the wound can be seen; it can be dressed as occasion requires; means can be taken for the evacuation of any matter that may form, and all without any change of position or suffering to the patient. The confinement to bed will be much shortened, and the health of the patient thus prevented from declining. In extreme cases, when there is great comminution of the bones, and laceration and bruising of the soft parts, as by entanglement in machinery, or by the passing of a heavy body over the limb, primary amputation may be deemed advisable. This step will be taken when gangrene would otherwise inevitably follow. Various considerations will have weight in coming to a decision in such cases, as the age, the previous habits, and state of the constitution of the individual.



A sketch is here introduced of a limb which was removed shortly after the accident. The patient was of healthy constitution, and under forty years of age. Many limbs much more mutilated, have been preserved. The integument has been removed, and the parts so far dissected, in order to show the displacement of the astragalus, which might readily have been taken away with every chance of a favourable termination.

Diseases of joints, of a serious nature, originate in a variety of ways, and in any one of the tissues which enter into their formation and composition. These are attributable to injury, as sprain or contusion, but this may have been so slight, and so slowly followed by signs or symptoms causing alarm, as sometimes to have been nearly forgotten; the mischief being then supposed to arise spontaneously, and altogether through some vice in the constitution. Many persons certainly are so slightly constituted, in these and other respects, that but very slight causes operate, in deranging the functions and structure of their organs and apparatus. Very generally it will be found, that at some time or other, force has been applied to a joint, which has run into a diseased condition, though long perhaps before swelling, or pain, or difficulty and awkwardness in raising it, or alteration in the form, or size of the limb, have attracted attention. These circumstances indicate a slow degeneration of the synovial membrane, of the cartilage or of the surface of the bone, which, by judicious management in the early stages, may very often be prevented from making progress, and ending, as they would

otherwise inevitably do, in complete disorganization of the affected part, and serious deterioration of the general health.

In a great many cases presented to the surgeon, the exciting cause is palpable enough; the joint has been violently wrenched, and perhaps not kept at rest at the time, or sufficiently long, to allow it to regain its normal condition; or a violent contusion has been inflicted. The synovial capsule is filled with blood, or again the joint may have been accidentally opened; or the bones in the neighbourhood have suffered solution of continuity, the articulating ends being split, and perhaps comminuted. A very good case is related in the Lancet, which shows the danger arising occasionally from fracture into a large joint. The patient's life was saved under very desperate circumstances, by the opening of deep abscess and subsequent amputation of the limb. Inflammation may have commenced in the shaft of the bone, may have terminated in abscess or necrosis; the epiphysis may become affected, and the joint be thus involved secondarily. The second case, copied from the Lancet, vol. ii. for 1836-7, illustrates this well.

"CASE I.—S. L., aged 35, was admitted, March 27, under the care of Mr. Liston.

"*History.*—She states, that, on closing a door at the top of a flight of steps which she was about to descend, she was precipitated to the bottom, having at the same time her infant of one month old in her arms: in saving the child from injury, she fell with her left leg under her, she 'scarcely knows how.' She could not rise from her position without assistance. She sent for the surgeon who usually attends her, who ordered the application of several leeches to the knee, and in the course of a few hours she was brought to the North London Hospital.

"*Symptoms on admission.*—The knee was much swollen; there was great pain in the joint, on manipulation, and much unnatural motion. The leech-bites were still bleeding. Fomentations to be applied.

"March 28. Swelling much decreased. From the extensive and unnatural motion of the limb about the joint, Mr. Liston, at his visit, decided that at least the tibia was fractured; the limb

was put up in one of his splints, by which step much relief was afforded.

" April 4. Pain in the knee; on removing the bandages some of the leech-bites were found ulcerated, and surrounded by a deep blush of redness. Water dressing, and the roller lightly over it.

" 13. There is a good deal of constitutional irritation, and the knee is in a state of erysipelas; there is a little purulent discharge in the popliteal space. Ten grains of the hydrarg. cum cretâ, followed by salines.

" 14. Bowels much moved, great pain in the head. Dr. Thomson saw her, and ordered a mixture of camphor julep, and ammonia.

" 16. From this day to the 19th, she gradually became worse, exhibiting all the symptoms of typhus mitior. The leg has become of a dark livid colour, which has extended from the extremities of the toes to the trochanter major. The limb is tense and swollen, though not painful. Has an indescribable feeling in the head, not exactly pain. She has a constant uneasiness in the region of the heart, which is occasionally rendered much more distressing by the occurrence of spasm in the part. On applying the ear over this region a sibilant rattle is distinctly audible. Pulse quick and weak. Twenty drops of sulphuric æther in an ounce of the decoction of bark, every four hours.—Brandy, wine, beef-tea, &c. Mustard cataplasm under the left mamma.

" 20. Passed a restless night. Eyes wild, but she is rather more collected. The head to be shaved, and a blister placed on the nape of the neck. Leg much the same. Continue the medicines; two grains of calomel and one of opium every night.

" 21. Slept all night. Tongue more dry and coated. On a careful examination of the leg, no fluctuation could be discovered.

" 23. No better; complains still of the pain in the head and about the heart. Redness of the leg beginning to disappear Leg tender on pressure. Continue calomel, omit the opium.

" 24. No sleep during the night, fæces and urine pass involuntary. Takes no nourishment; lips are wetted with a little

wine; countenance extremely anxious; does not answer when spoken to; stares wildly around; voice nearly inaudible. Mr. Liston evacuated a small collection of matter which had formed above the condyles of the femur and close to the bone.

"25. Much the same; pulse weaker; redness of the leg gradually disappearing; her countenance indicates pain when the leg is touched; has not slept.

"26. No sleep; head to be again shaved; cold ice to the scalp constantly.

"27. No better; no discharge from the wound made on the 24th. As fluctuation was again perceptible, the wound was reopened, and about four ounces of laudable pus mixed with blood were discharged. Delirious; fæces and urine still pass involuntarily.

"28. Better; more collected; matter flowed from the wound on removing the pledget of lint which had been inserted into it.

"May 8. Has continued to improve since last report. There is a free discharge from the orifice in the leg.

"15. Not quite so well; appetite not so good; discharge continues from several openings about the joint, which has been very loose and puffy for some time; the bones grate upon one another. The patient, after recovering from the immediate effects of the erysipelas and the deep collection of matter, has again begun to fall off, to become hectic, and to lose ground every day. It was plain that the articulation was destroyed, and that amputation, if it could be ventured upon, would afford her the only chance of recovery.

"*Operation.*—The patient was brought into the theatre and laid upon the table, with her legs projecting over its edge, the affected limb being carefully supported by an assistant. Mr. Liston stood on the outer side of the limb; he transfixed the limb in the transverse direction, anterior to the femur, about five or six inches above the knee; carried the knife downwards, and brought it out about two inches above the knee; by this means the anterior flap was formed. He transfixed the limb a second time, posterior to the femur, carried the knife downwards and

outwards, and formed a posterior flap, rather longer than the anterior one. The flaps were held back by an assistant, and Mr. Liston divided the remaining soft parts by a circular sweep of the knife. The bone being sawn through, and the vessels secured, the flaps were brought together by three points of interrupted suture. She only lost three ounces of blood. After the operation, she complained of great pain, which was relieved by half a drachm of tincture of hyoscyamus. Dozed during the night.

"*Dissection of the limb.*—The tibia had been broken about two inches below the knee, and split into the joint; the fracture had united, but an opening communicating with an extensive abscess all around the articulation still existed in the cavity of the capsule, through the original fissure. The apparatus of the joint was thoroughly disorganized, the semilunar cartilages were detached, and floating about in the purulent secretion with which the thickened and softened synovial capsule was filled. The end of the femur was almost entirely deprived of cartilage and very vascular; the crucial, lateral, and posterior ligaments, were softened, swollen, and relaxed. Several abscesses in the cellular tissue, and in the neighbouring bursæ, communicated with the joint.

"June 27. The patient was very low and weak for some days after the operation, but she has gradually gained strength; the stump has healed; she is able to get out of bed, and is quite convalescent."

"CASE II.—H. D., aged 13, was admitted May 22, under the care of Mr. Liston. He states that, about two months since, he was struck on the right ankle by a stone. He did not suffer any inconvenience from the blow until a week afterwards, when the joint began to swell; the swelling soon extending up to the knee-joint. The swelling and pain abated under the use of poultices. In the course of a few days, however, the ankle was again attacked by inflammation. Mr. Smyth of Vauxhall Road, was now called in to attend him, and a collection having formed in the neighbourhood of the ankle-joint, incisions were very properly made in the line of the tibia. A profuse discharge took

place, and has continued ever since; at the present time the boy is in a state of hectic from the effects of the discharge. Amputation, as in the former case, was performed, and with the same success.

"Mr. Liston pointed out in this case that the periosteum, where it was dissected back from the bone, was much thickened, and very vascular, that the reproduction of new bone was going on, and superseding the old in scattered portions, and in various situations. The shaft of the tibia had perished extensively, as was visible through several large cloacæ. No new bone was perceived on the outside of the periosteum, but it appeared to be deposited by the vessels of the periosteum and old bone, but betwixt the two, adherent to that portion of bone which had retained its vitality. Upon looking at the superior surface of the tibia, a small circular opening was observable, communicating with the knee-joint. The whole synovial membrane was exceedingly vascular, and ulceration of the cartilage had commenced at several points. Amputation, in both cases, was rendered necessary by disease of the knee-joint succeeding to injury and inflammation of the bone, and it was performed in both in the middle of the thigh."

From these or other causes, inflammatory action may be excited, which may be overlooked at first, and trifled with, and thus permitted to gain head. Or from the first, it may have been of a dangerous, violent, and intractable character; formation of matter cannot be prevented, the articulating cavity is expanded, lined by an adventitious membrane, secreting pus; it is in fact converted into a large abscess. The cartilage disappears by ulcerative absorption, the ends of the bones are exposed, the ligaments are softened and disorganized; the limb becomes enormously swollen, the joint is found unusually loose, partly from the disorganized, softened, and relaxed state of the lateral and other ligaments here noticed,—partly in consequence of the muscles being paralysed, as it were, and weakened from pain and disease. Any motion is performed with great suffering and agony, and distinct grating of the bones, one on the other, can be perceived. Such is the progress of mischief in the large, as in the smaller

articulations in the elbow or knee, and in the joints of the fingers. Disease of joints is sometimes propagated from the soft parts, from injury or morbid degeneration of these. Abscess of the cellular tissue, or of bursæ, often leads to affection of an adjoining articulation. Again, disease originally in the head of a bone, may lead to affection of the cartilage and synovial membrane. In the advanced and more serious stages of these diseases, which in this volume principally demand consideration, whether in the acute or chronic form, it is often next to an impossibility to say in what tissue morbid alteration had first commenced. By a very anxious inquiry as to whether swelling existed first; or constant pain of a violent character, increased on motion, and more severe during the night, preceded swelling, a pretty shrewd guess may be formed, that either the synovial membrane originally underwent changes; that its capillary circulation became loaded; that it became pulpy and thick, and that its secretion became more profuse and vitiated, thus accounting for the swelling; or, again, that in the first place, the cartilage was absorbed, on one or other aspect; or that the bone at the commencement of all, was so far affected;—all this will serve but little purpose, when bones, ligaments, cartilages, and synovial membrane are equally involved in one mass of disease, as is sooner or later the case, whichever tissue is previously affected, if the progress of the action is not put a stop to by energetic and well-devised means, and opportunity thus afforded for the establishment and continuance of a healthy and reparative process. As the disease advances, the general system begins to suffer from constant pain and irritation. When discharge is established, and a continued drain from the circulating fluid is superadded, the strength and powers of the patient gradually sink. No improvement in the health can rationally be expected from the most judicious management, certainly not from drugs or chemicals of any kind, until the cause is in some way removed. A speedy improvement follows any favourable change of the local malady, any abatement or removal of the irritation and discharge.

The treatment necessary to control or check disease in joints,

in particular cases, demands, on the part of the practitioner, a careful, steady, and proper understanding of the various pathological changes, a nice discrimination, and a perfect acquaintance with the effects and objects of the various therapeutic means. In all injuries and diseases of joints, in the slow strumous degenerations, white swellings, (a most comprehensive term,) as in the most violent form of articular inflammation, perfect quietude and repose of the affected part form the most powerful and essential curative indication; neglect this, all other means are found nugatory, and were as well untried. Nothing but disrepute and disgrace can accrue to the profession and professors if hot irons, moxas, and issues continue to be used, as they often are, inconsiderately enough, to the neglect of more powerful and less appalling means. Instant relief invariably follows the securing a state of perfect and absolute rest; other means, local and constitutional, are thus afforded a fair chance of doing good, and the natural efforts towards a cure are no longer thwarted and interrupted. But, above all, the effect on the general health is most remarkable and cheering; even in very complicated and bad cases, in which sinuses communicate with the cavity of the joint, in which the heads of the bones are ascertained to be in a state of ulceration or partially necrosed, the good effects of perfect quietude of the joint will soon be manifested by the cessation of pain, the diminution of discharge, and the speedy improvement of the patient's health. A cure of the local mischief by this means may not be possible, but much will often be gained, as regards the success of ulterior proceedings, by the certain amendment of the patient's condition, and the rapid change for the better.

The sudden improvement in the health of patients worn down by the disease of a joint can be witnessed at any time, in the cases of morbus coxarius, treated on the principle here laid down, at the North London Hospital. In the first stage of the disease, during the period when there is apparent elongation, and also where ulceration has made progress and the limb is shrunk and shortened, great benefit and relief will be found to follow the

adoption of this method; the joint is placed extended, the most favourable position it can occupy, should permanent stiffness arise. A splint, similar to that used by the old surgeons, composed of some soft substance, as tow and albumen, described by Scultetus, and delineated by him even to the eggs on a platter, is applied; we use coarse soft lint soaked in a strong solution of gum acacia; it is laid on in strips over the side and pelvis, from the short ribs down to below the knee, and made to embrace the limb fully. A layer of dry lint is first applied, and then two or three others, soaked in the mucilage, follow; this is covered by a fold or two of coarse calico, and the whole retained by a roller. In cases where the limb has been retained for a long period adducted and bent, and where some little trouble and uneasiness has arisen in placing it in a favourable position, it will be advisable to preserve it so by the use of the thigh-splint, as for fracture, for some twenty or twenty-four hours, until the composition dries, and the splint has adapted itself closely to the parts.

I had occasion, very lately, to observe the good effects of this treatment in a very remarkable case, under the care of my friend Mr. Auriol, of Alfred-place, in which, from disease, what remained of the head and neck of the femur was luxated upon the pubes. Immense abscesses had previously formed, and were opened; the limb became rather suddenly everted and slightly shortened. The luxation was easily reduced, and the apparatus here recommended applied with great relief and advantage.

The gum splint can be made of any form, so as to allow of its being taken off, trimmed, and lined with wash-leather, or protected with a layer of oil-silk, and reapplied, with a clean bandage. It can also be fashioned so as to leave any part exposed, in order to admit of dressings; the discharge from issues and abscesses can thus be allowed to escape, and the parts attended to without disturbing the limb. Two splints can be formed instead of one; in fact, the apparatus can be varied as circumstances demand, and it is applicable in a great variety of cases and to any articulation. A perfect mould is formed of the part, and this can be applied with any degree of tightness that is

suitable and comfortable to the patient. A firm and very useful splint is, with the same view, made of leather dressed without oil, cut to a proper form, moistened in hot water, and applied with a roller. These splints soon become firm, forming a case fitting the part accurately; they are then pared, fashioned neatly, and lined. In many chronic cases these answer admirably; they are readily undone and reapplied: so are the gum splints, and the latter can be fitted with less disturbance of the limb, which, in many cases, is a great recommendation. In the acute affection of some joints—as the wrist, or knee—a well hollowed and fitted wooden splint will often, for a time, be found useful; it is retained by looped bandages. Provision being made for the perfect quietude of the limb, recourse must be had to such treatment as the nature and progress of the disease may demand and the system of the patient will bear.

In acute inflammatory attacks, very active antiphlogistic means must be adopted, so as at once to make an impression upon and extinguish the action. Blood is taken from the arm and from the neighbourhood of the part, leeches are to be applied in great numbers and repeated at short intervals, if the symptoms do not readily show a disposition to yield; a niggardly use of leeches will do more harm than good, and some dozens had better be applied together than in detachments. The object is to relieve the affected capillaries; fomentations will relax and keep up a determination to the surface; cold lotions, so often and inconsiderately used, must have the opposite effect. It is a thorough routine system resorted to by some practitioners, useful in few cases, and productive of aggravation in many. The good effect of cold applications, in any case after inflammation has commenced, is very questionable, however useful they may be before the action has come on, and with the view of preventing or moderating it. After the more violent symptoms have abated, a further determination and discharge from the surface will be productive of good effects. Vesication may be produced by the common cantharides plaster, by rubbing the surface externally with the nitrate of silver, or an eruption may be brought out by

friction with croton oil, or a strong ointment of the tartrate of antimony, (two drachms to the ounce, at least, for the lower limbs in adults,) its strength must be proportioned to the part which it is desired to draw discharge from, and to the age of the patient.

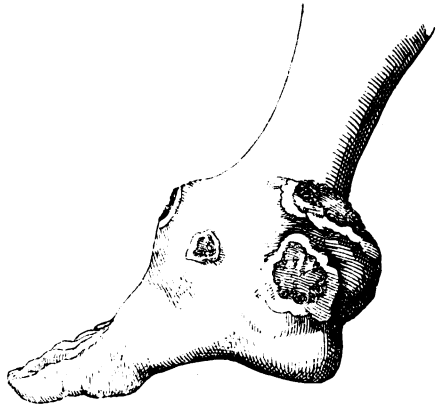
In chronic swelling of a joint, following an acute inflammatory attack, or coming on slowly and gradually, as a consequence or not of some slight injury, the first object of the practitioner will be to arrest the progress of the disorganization, to stop it short of destroying the cartilages and encroaching on the bone; he will also have to endeavour, by all means in his power, to promote absorption of the fluids effused into the synovial capsule and bursæ, and to bring their secreting membranes into a more healthy condition. These indications, in consequence of the advanced stage of the disease and the state of the constitution, are not easily fulfilled in many of the cases which present themselves. In the more favourable cases, speedy amendment will follow the fixing of the articulation and the application of uniform and gentle pressure. This is effected somewhat after the fashion of Mr. Scott's plastering, which has been employed very extensively and rather indiscriminately, to all and sundry affections of joints, and to many swellings and pains in other parts. A great part of Mr. Scott's process—all that part of it intended for effect—may well and safely be dispensed with, such as the bathing with camphorated spirit, the mercurial ointment, and a vast deal of the plastering. It is advisable to give support to the lower part of the limb by a roller, to near the affected joint; the surface should then be covered by lint, spread with some gently stimulating application, soap cerate with camphor answers well; the whole articulation is then to be surrounded and supported by long strips of plaster, crossed in various directions, and drawn with a very moderate degree of tightness, so as to give a feeling of support without occasioning uneasiness: the roller is then carried upwards over this dressing and to some extent above the joint. In order to prevent motion of the affected parts, which would tend to keep up and increase the

mischief, leather splints should be applied outside. A few dressings of this kind, at intervals, (the time of changing the plasters will depend upon a variety of circumstances, as their becoming slack, which shows some subsidence of the swelling, the existence or not of discharge, &c.,) will often be followed by a most manifest improvement in the external appearance of a diseased joint, and sometimes there is reason to believe in its internal condition. Amendment of the general health follows almost as a necessary consequence, if the constitutional derangement has been merely attributable to the disease in the joint. Well-fitted splints, such as already recommended, can then be applied alone; the gentle pressure and support, having served the purpose of promoting absorption and removing the effusion and thickening, thus no longer required, can be dispensed with. The treatment above recommended may, in some cases, be very advantageously preceded by the local abstraction of a small quantity of blood, or the establishment of some discharge from the surface, in order to remove any painful feelings or excitement that may exist, and which might be aggravated by the pressure. Again, the proceeding must occasionally be suspended, to give place, for a time, to antiphlogistic treatment, and resumed, according to the circumstances of the case. During the cure, it will be necessary to keep in view the most advantageous position of the limb, and the more so if, from the duration of the disease and the probable pathological changes, there is reason to dread impairment of the motion of the articulation. By gradual and steady extension, by means of a simple wooden splint, made to fit the leg and thigh, and a common roller, or by the use of a jointed splint, and extending screw, the knee-joint may be brought into nearly a straight position, so that it shall be serviceable in progression. By similar means the elbow may be bent, to form a right-angle with the humerus. These attempts must be made with great prudence and caution; abated or suspended, if any painful feelings should arise, threatening excitement of the circulation of the part, or the slightest aggravation or return of the morbid action. The progress of the cure will be often much

expedited, by great attention being paid to the secretions and excretions from the skin, kidnies, and digestive apparatus. The ejection of sordes, and worms from the bowels of children, should not be neglected. The exhibition of the balsam of copaiba will answer a good purpose in many cases. Various tonics and alteratives, (certainly not mercurial,) will be serviceable, and must be varied, as occasion requires. The alkalies, sarsaparilla, and preparations of iodine, are all useful, either separately or conjoined.

In the more painful and dangerous affections of the articulating apparatus, when there is reason to suppose that the cartilages are extensively absorbed, (whether this be a primary or secondary affection,) when the cancellated texture of the bones is more or less affected, good effects may yet follow judicious treatment. Here the principle of preventing all motion, if well followed out, will be found to answer a good purpose. Great relief will often be experienced from establishing a permanent discharge from the neighbourhood of the diseased tissues. This can be done simply, and effectually, without causing alarm, or exciting much pain, by confining with a piece of lint and diachylon plaster, a small bit of caustic potash on the skin near the diseased joint. After the slough separates, the sore is dressed with any simple ointment, and it is deepened and made to discharge freely, when disposed to heal, by a few hours' application of the antimonial ointment. A seton may be preferred in some situations; certainly discharge can be kept up and derivation obtained from the affected parts thus, fully as well as by actual cauteries, moxas, pea issues, or other farrier-like practices. Great care must be taken in the placing of issues; they should be near, but not upon a joint. Serious results have now and then followed their careless application. Diseased action has been increased, the cautery having reached, or even penetrated, the synovial capsule. I write after some experience, and from cases and specimens now before me. Many diseased joints, more especially in the working-classes, are trifled with or neglected, until their structure is irretrievably destroyed, and until discharge, irritation, and fever, have reduced the patient to the lowest ebb.

In spite of all that science can suggest, or art effect, disease in joints, after having gained a certain point, will produce destructive results. Portions of the cancellated texture, which have been acted upon by the absorbents, and have become carious, or which have perished, are not repaired. The dead parts must be detached. An abscess surrounds these unsound or necrosed spots; it makes progress, and comes at last to the surface.



The swollen and puffy state of the parts is here well represented with the elevated openings giving vent to copious purulent secretion, and leading to the diseased articulating ends of the bones. The disease, in the deeper parts, at the same time, is necessarily aggravated. Grating of the articulating extremities is felt on motion, as may be easily understood from an inspection of such specimens as the annexed sketch is made from. The joint is loose, and can be moved laterally, in an unnatural manner, This arises, as already adverted to, from the laxity of the lateral and other ligaments. Gelatinous effusion takes place betwixt their fibres: they become soft and swollen; a probe can perhaps be passed into the cavity. Anchylosis is not impossible or infrequent, when circumstances favour it, even after extensive ulceration of the cartilages and surface of the bone has

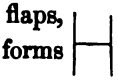
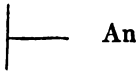
taken place. But the existence of carious cavities, or of necrosed portions, perhaps a combination of both, will very frequently forbid any hope of benefiting the patient, unless by surgical means. The patient's health must go on declining, and his lungs will ultimately suffer. Recourse must often be had to amputation of the member, in order to save the patient, and it is surely better, in these cases, as Dionis has well remarked, that the patient should take the chance of living with three members, rather than the certainty of dying with four. The amputations are described seriatim in Chap. X. The surgeon must of course be fully impressed with the absolute necessity and propriety of such a proceeding, before he proposes mutilation. He is justified in this course only when the structure of a part is destroyed throughout, when it can be no longer useful, when from immobility and awkward position, a limb, or a portion of it, proves an incumbrance, when the retaining an injured or diseased part, must lead certainly to dangerous consequences, as the contamination of the system, and deterioration of the health and strength, by which the duration of life must be inevitably cut short.

Extremities can occasionally be saved by the removal of the diseased portions of bone. Irregular operations for this purpose—operations for conducting which no rule can be laid down, may be performed in all situations. I have made incisions successfully on the heads of the bones of the metacarpus, on those of the carpus, on those entering into the composition of the ankle-joint, on the tarsal bones, the cuboid calcaneum, &c., and removed dead or diseased portions; the wounds have been kept open until healthy granulations filled up the cavity, and coalesced with those of the soft parts. Various escharotics have been used to get rid of unsound parts, of which perhaps the best and most manageable is the red oxyde of mercury. A firm, white depressed and adherent scar, marking its permanent nature, has resulted in a great many of these cases, and the patient has had the use of the part as well as his general health restored. Some articulations are so situated as regards the soft parts, that they can be got at without difficulty, and the ends of the bones forming

them, readily enough removed. Such operations may, with propriety, be resorted to, when the patient's general health has not suffered much; or where, from keeping the joint in a state of quietude, the discharge has abated, and the system recovered from the effects of the irritation and constant drain. When, however, the soft parts are much diseased, when, as is often the case, the disease is not limited to the articulating surfaces, or when the patient is reduced to a very low state by hectic, it may not be very prudent to try the experiment, as it has happened that, after all, the proceeding has not been followed by removal of the whole disease, or a subsidence of the constitutional disturbance; and amputation has, in the end, been deemed advisable. This operation, which might, alone, have been borne up against, has, in that stage, been followed by a fatal result.

The elbow-joint is the one, of all others, on which clean excision, or resection, as it has been called, may be had recourse to, with the best propect of a successful issue. The bones are thinly covered on one aspect, and can be got at, without risk of wounding any parts of great importance. It is highly desirable, in many cases, to preserve the hand, even though no very powerful use can be made of it; and unless the operation on the elbow is performed, when the person is very young, and the portion of bone removed is very small, the motions of the joint must of necessity be very weak and unsteady. In the operations which I have performed on the adult, amounting in all to five, for the thorough removal of the ends of all the three bones, I have aimed at bringing about a sort of ligamentous anchylosis; having steadied the part for a long time, by means of leathern splints. In fact, the patient, in order to use the fore-arm and hand to any advantage, will require to have some permanent contrivance, to fix the fore-arm at a right-angle with the upper-arm. In young patients, on the contrary, the motions of the part may be encouraged, and with every chance of their becoming pretty free and strong.

The involvement of the bones in disease, and its extent, being ascertained by the careful use of a probe, and circumstances being

favourable for their removal, the plan must be well considered, and the necessary instruments got in readiness; these consist of a strong, sharp-pointed, broad bistoury, an amputating saw, a small narrow saw without a back, a copper spatula, cutting forceps, dissecting forceps, tenaculum, hooks blunt and sharp, suture needles, and ligatures. The patient is placed prone on a table, or, what is better, he is seated in a chair with his back to the operator; an assistant holds the hand and forearm, and preserves it extended, whilst another prevents the patient from turning round. The incisions may be variously planned, so as to form flaps, the raising of which shall expose the joint fully. The forms  have been followed; latterly, I have preferred the more simple one  An incision is made on the radial side of the ulnar nerve, and in the direction of the limb, by pushing the point of the knife through the integument, and fibres of the triceps to the back of the humerus, and carrying it in contact with the ends of that bone and of the ulna for about three inches; another, commencing over the outer condyle of the humerus, and penetrating the articulation, is made to fall on the middle of this at right angles; the two flaps are reverted by a few strokes of the knife, and the soft parts along with the nerve are turned over the inner condyle; the ends of the bones, but slightly retained by their ligaments, are turned out of the wound by flexing the forearm; the soft parts are so far detached by cutting upon and close to the bones; the extent of ulceration or necrosis is then well ascertained, and, by the application of the saw, the unsound parts are removed. During the cutting of the bone, the copper spatula may be of use in protecting the nerve or other soft parts. A partial anchylosis will be found occasionally to have formed, and then the small saw and cutting forceps may be called for. In operating upon young patients the forceps may sometimes be used in preference to the saw, the bones being soft, and extensive removal not being demanded. After the operation is concluded, the clots are removed, and perhaps a twig or two may require ligature.

The hook, or tenaculum, or spring-forceps with points similar to Assalinis tenaculum, will be found to answer better than the dissecting-forceps in dealing with vessels in condensed parts. The further extremities of the incisions may be brought together by three points of uninterrupted suture, and the size of the wound thus abridged; the middle, where the incisions meet, must, of course, heal by the second intention; wet lint is applied over the whole wound for some hours, a few strips of plaster are then put upon the space where the sutures were made; these are soon cut out, and the opening over the joint treated with the tepid water-dressing. After a week or two, the limb, which has been kept on a pillow half bent, is secured in splints and supported in a sling; when the wound has healed, the motions of the fore-arm and hand should be encouraged.

The shoulder-joint may be made the subject of a similar operation, but the necessity for it does not so often arise. The head of the humerus, shattered by gun-shot, without great injury of the soft parts, may be cut upon and excised; amputation of the limb may thus be averted. The articulation is the seat of disease, named omalgia, and this terminates occasionally in deep ulceration of the head of the humerus, and sometimes also of the articulating process of the scapula; the shoulder and upper-arm are first noticed to waste; the motions are weak; on examination it is found, that the patient has great pain when the joint is moved, and when the surfaces of the bones are brought in contact. In a more advanced stage, abscess forms, and a probe reaches the joint; the health declines; hectic and consumption carry off the patient. The head of the humerus can with great facility be removed, and diseased portions of the scapula can even be reached for this purpose; the positions of the openings may perhaps somewhat determine the line of incision; it may be made from the point of the acromion, through and near to the insertion of the deltoid, or it may course along the posterior border of this muscle; the joint is at once reached, and by carrying the arm across the chest and raising the elbow, the head of the humerus is protruded, examined, and so much as is in an unsound condition taken away by the application of the

saw; the mode of using the instrument is treated of in Chap. X. The edges of the wound, which should be free, are held aside by bent copper spatulas; the glenoid cavity is looked to, and, if unsound, as is pretty certainly the case, its neck is embraced by a pair of large cross-cutting bone-nippers and taken off; the upper part of the wound is put together at a proper time and in the right way, as described in Chap. II.; space is left at the lower corner for the escape of discharge, and the limb is kept very quiet and steady for a considerable time. Resection is scarcely applicable to other joints; it has been attempted on the knee, but with no encouraging result.

CHAPTER V.

ON INJURIES AND DISEASES OF MUSCLES AND TENDONS.

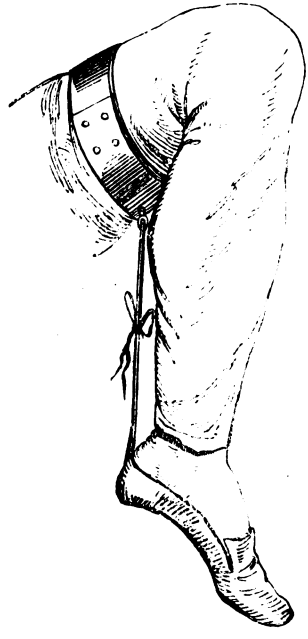
DIVISION of muscular fibres is followed by their immediate retraction and by that of the tissues connected with them, towards their fixed points. This injury is often accidentally produced, sometimes by premeditation, but it is the aim of the surgeon, in the greater number of cases, to avoid cutting across muscular fibres. The division of the super-imposed parts, not in the direction of the fibre, is very often a serious error. The injury is simple, as when, during some sudden exertion, a muscle or part of it gives way in its sheath, or is torn from its tendon, whilst in action; or compound, when it is divided from without. Division of the integument will sometimes, however, occur, accompanied with laceration of fascia and muscular fibres from sudden and extreme bending of a limb. I have seen two cases of laceration arising in this way, on the fore part of the thigh; one in an old man who had long laboured under a stiffness of the joint, the other in a very active and handsome young lady. Division of muscular fibres to a considerable extent frequently follows external injury; the skin, though bruised, remaining undivided; and solution of continuity also takes place in the moving apparatus of a limb. without external wound, as in many simple fractures. The muscles which give way most frequently from violent action, are the gastro-enemius, the biceps flexor-cubiti, and the extensors of the leg; the first is common enough, and of the second accident I have witnessed several examples; the third happens rarely, so far as I am aware. Sir A.

Cooper has alluded to two cases, and some time ago I saw a very complete separation of the quadriceps from its tendon in both limbs. It occurred in the person of an old servant, who was descending to the cellar, carrying several bottles of wine, both hands being occupied; he suddenly felt both his feet slipping from under him, and in a violent effort to prevent his falling backwards, the injury took place. The separation may be partial or complete; it is followed by sudden pain in the part, by instant loss of power of extension or flexion, according to the situation of the injury. A void can be felt when the attachments of the muscle interested are removed from each other; the space is soon filled up by coagulum, and, generally, considerable extravasation occupies the surrounding cellular tissue. The larger tendons are occasionally torn asunder; the ligament of the patella, as I have stated in the last chapter, is torn, though very rarely, so as to admit of the ascent of the patella. The tendo achillis snaps asunder at times, during the powerful extension of the foot, and it is not to be marvelled at, considering the tremendous strain that is put upon it in raising the body.

The second Professor Monro, was, it is known, the subject of this accident, and has described his own case and the treatment he adopted. A no less distinguished man in our profession, John Hunter, it seems, also ruptured his tendo achillis. The accident rarely happens to young persons whose muscles are in constant and full play. It is unknown amongst the athletæ who exhibit in our ampitheatres, who raise their bodies, even without the assistance of spring boards, to an amazing height and distance in the air, and who support and move under immense weights. It is an accident that most frequently occurs to those who have been unaccustomed to violent action of the muscles for a time; it happens to gentlemen of mature years who, forgetting themselves, join in the sports of youth, who attempt to skip and dance, as they had been wont to do; suddenly they suppose that some one has inflicted a blow from behind on the leg,—their dancing is put a stop to, the foot cannot be extended, and the nature of the case is forthwith appa-

rent to the most careless observer. The solution of continuity in muscles and tendons, if favourably placed, is repaired readily; the blood is absorbed; new matter is secreted, this becomes organised, and is converted speedily into a substance somewhat resembling the original tissue, from the vessels of which it has been secreted; there is a degree of thickening around, a sort of knot for a considerable time, but this gradually disappears, and the limb regains its natural shape and use. The smaller the space allowed betwixt the divided surfaces, the less will be the plastic effusion, and the more perfect the cure. Union may be rendered imperfect and weak, may indeed be entirely prevented, by malposition.

The principle of preserving the injured part perfectly at rest, and with the muscle or muscles interested in the injury in a state of relaxation, requires only to be kept in view and fully acted up to; for instance, in rupture of the biceps or its tendon, the elbow is bent, the arm carried in a sling, and the position secured by the application of a splint of wood, leather, or pasteboard, as may be most convenient. Time must be given (six or eight weeks) for firm union, before even passive motion is permitted. The leg is to be put up and preserved in the same position as that recommended in treating fractured patella, (page 80,) if by any chance lesion of the quadriceps femoris has occurred. When any part of the extending apparatus of the foot has unfortunately given way, the mode of treatment exhibited in the annexed sketch must be adopted. The means by which the end is perfectly attained cannot be rendered more simple; the whole apparatus consists of a slipper, a piece of strong cord, and a broad ring like a watch-



dog's collar, either in two parts, connected by studs, or jointed.

The muscles or tendons are not the seat of any pathological changes requiring surgical interference; they become wasted and stiffened from inaction, after injuries or inflammatory action, and are often restored by being again put into play, by friction, passive motion, and various exercises. Minute cysts, containing a small animalcule, (trichina spiralis,) are sometimes seen in the muscles of subjects in the dissecting-room, but it does not appear that any signs are presented during life denoting the existence of such. Muscular parts are occasionally involved in diseases, commencing in the tissues with which they are connected, or in whose vicinity they are placed. In some diseases of bones and joints they are displaced, and sometimes morbidly affected. They are separated from their connexions by formations of matter; sometimes they are destroyed, as in psoas abscess, by long continued pressure of pus. In evacuating collections, as in the abdominal parietes, care must be taken not to injure these parts still further; the direction of the fibres is to be considered, and the incision scrupulously made to correspond to it.

I had once occasion to remove the sterno-mastoid muscle of one side, involved in a sarcomatous tumour from its origin to its insertion; the most fastidious critic will not refuse the term sarcoma to this morbid growth, though, in all probability, the muscular fibres may have been involved secondarily. The tumour was limited by a cellular sheath, yet the dissection was difficult and extensive. The patient made a good recovery, and no malposition of the head followed, the trapezius, probably, of the opposite side had done the duty of the diseased muscle for a considerable time before its removal.

Operations have been proposed and practised on muscles, and often very unnecessarily, for the removal of deformity; that for wry-neck, torti collis, as it was called, is now almost abandoned, the distortion, in general, not arising from any inherent vice, shortening, or marked contraction of the sterno mastoid. Instruments were contrived for the purpose of dividing the muscle close

to its origin, and may be, for aught we know, re-invented in this improving age. This operation may, in some rare cases, afford facility in putting the head straight. Some time since, I saw a case in which great distortion arose from contraction in one of the mastoid muscles, caused by bad habit; the young woman had laboured under a painful ulcer of the neck, and kept the head to one side for a long while in order to relax the affected part and procure ease from suffering. The division of the muscle was advised, but not at the time agreed to; there is no difficulty in the matter.

It has been proposed to divide the palmar aponeurosis in some contractions of the hands and fingers, a very troublesome affection, and attended, in an advanced stage, with almost total immobility of the organ. Some years ago, I had recourse to the proceeding in several cases; the relief was only temporary. In many of the cases, as I have ascertained by careful dissection, the contraction does not arise so much from disease in the aponeurosis, as from rigidity of the articulating apparatus of the phalanges, change in the form of the end of the bones, and a partial ligamentous anchylosis. This is either a primary or a secondary affection; when it exists, neither the cutting of the fascia nor of the muscles inserted into it, can, in any way, be expected to prove beneficial.

The division of the tendo achillis has, of late, been resorted to in some cases of rigidity and shortening of that structure, and of the muscles inserted into it, causing permanent extension of the foot, and consequent lameness. I was consulted on a case of this nature lately by Mr. Whipple, of Plymouth, and advised the operation; it was accordingly performed, and with the most gratifying results. The case has been communicated to the Medico-Chirurgical Society. The patient, a boy of eight years, had been unable to put his heels to the ground; he was obliged to use crutches, and, even with their assistance, his progression was not satisfactory; very shortly after the tendons had been cut across, great improvement in the appearance and functions of the parts followed, the youth being able, without any assistance, to walk many miles within a few months after the performance of the operation.

About two years ago my friend, Mr. Annandale, of Newcastle, and myself, in consultation, recommended this proceeding in a very similar affection of one limb, which had resisted all other means of cure, but the patient, at that time, declined submitting to the trial. The operation is a very simple one, and unattended with much pain or danger: the tendon can be cut by introducing a narrow knife—the lancet-shaped exploring needle answers the purpose very well—obliquely through the skin, at a little distance from it on the outside, and by directing the edge against the resisting fibres, the foot being kept powerfully extended by an assistant, the object can be effected with scarcely a perceptible external wound, and with the escape only of a drop or two of blood; the ends are kept asunder sufficiently to admit of the proper position of the foot, and this is preserved until the cure is completed, by the filling up and consolidation of the void. The apparatus may, in the first instance, consist of a cord or strap attached to the point of the shoe, and secured to a band on the fore part of the thigh, passed round the limb immediately above the knee; afterwards, a steel rod, jointed near its attachment to the shoe and with a strap across the instep, will be found necessary, and must be worn for a considerable period; the position is exactly the reverse of that observed in the rupture or accidental wound of the tendon. There it is of its normal length, and union without elongation is desired; here again, as in a similar operation on the flexor tendons of the horse, it is desirable that new matter should be deposited to some extent, so as to lengthen the tendon; this occurs to the extent of some inches after the operations of veterinary surgeons, and the new matter is strong and fibrous, more interwoven and condensed, however, than the original tissue. Some continental surgeons, who have, it seems, practised the operation extensively, divide the tendo achillis, allow time for its reunion, and then apply extension, so as to elongate the new and still plastic material, by which the union is effected. The operation has also been proposed and adopted in some cases, as a means of remedying the deformity of the common club-foot or varus.

In many of these cases, the fault is not so much in this or any

other of the tendons or muscles; the bones are, in the first instance, perfectly enough formed, but are somewhat displaced as regards their articulating surfaces. The ends of the tibia and fibula rest partly on, and are articulated with, the upper and inner aspect of the os calcis. The astragalus is thrown forwards, the os naviculare and the cuneiform bones are compressed and slightly altered in form, and the cuboid is pressed down upon the plantar aspect of the calcaneum.

During infancy the malposition can be remedied by very simple means, the parts being all pliable. The curvature of the tarsus and metatarsus inwards can be readily effaced, and the application even of a pasteboard or leather splint, secured with adhesive plaster, or, what is better, a splint for the purpose, to be had of all the bandage-makers, worn perseveringly, will, before the patient has rested upon the limb, have the effect of bringing the foot into a pretty natural and useful shape. In confirmed cases, the cure of the deformity will be more certainly and readily effected after the division of the tendo achillis. If muscles and tendons are to blame for this abnormal position of the foot, the tibialis posticus and flexor longus pollicis should not escape observation, but these cannot so easily or safely be interfered with. The rudiments of all the bones are present, and a favourable position only is wanted during their growth, to cause their natural developement. If the awkward position, however, is allowed to persist until ossification has advanced considerably, then of course the difficulties of the case will be increased. The bones are fashioned to each other, and fixed in their abnormal relations, and much altered in shape and size; the os calcis, more especially, is shortened; provision is made by the formation of a cushion of fat, thickened cuticle, and a large synovial pouch, over the end of the metatarsal bone of the little toe and the cuboid, for the unnatural bearing of the foot on its outer side. The ligaments on the dorsum, the superior calcaneo-cuboid, tibio-tarsal, cuneo-scaphoid, and dorsal ligaments, connecting the two last metatarsal bones to the cuboid, are strengthened, whilst those of the sole, the calcaneo-scaphoid, and inferior calcaneo-cu-

boid, are attenuated. The muscles of the limb are not strong or fully developed, but this is made up for in some measure by the increased muscularity of the opposite member, if that is unaffected. After a certain time, and in the severer forms of this congenital malformation, art cannot, in any way, avail.

Since writing the above remarks, I have had occasion to practise the division of the tendo achillis in a variety of cases and at different periods of life, in cases of simple extension of the foot, as well as in those complicated by inversion. In some of these a rapid cure was effected, and in all, marked good effects followed. Even in the most unfavourable instances, where the deformity was both great and of long standing, the application of proper apparatus within a week or two of the operation produced a more decided improvement in the form of the limb in two or three months, than usually follows the adaptation of mechanical means alone in twice as many years. The division of the tendon causes little or no pain, is unattended by loss of blood, and is not likely to be followed by any unpleasant consequences.

CHAPTER VI.

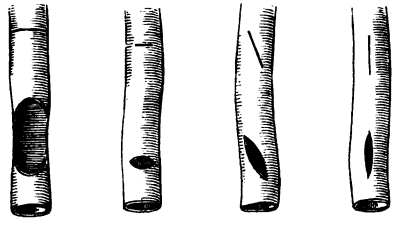
ON INJURIES AND DISEASES OF BLOOD-VESSELS.

THE bruising and detachment of an arterial trunk from its connexions, and the consequent diminution in the supply of blood to its coats, is followed, as is supposed to happen after some wounds, and is known to have occurred not unfrequently after badly-conducted operations, by sloughing or unhealthy ulceration and escape of its contents. Hæmorrhage to an extent proportionate to the size of the vessel, its vicinity to the heart, the force of the circulation, the quantity of circulating fluid, and the nature of the lesion, follows recent solution of continuity of the arterial ramifications, as a matter of course. An opening in the direction of a vessel does not gape much, and is said not to admit of the rapid or forcible ejection of blood; this is a mistaken notion, so far as I have had occasion to notice again and again. One instance may be given, to show that such wounds require prompt attention.

CASE.—I had the misfortune, on one occasion, to wound the anterior tibial artery of a middle-aged man. He had received a deep laceration across the forepart of his leg, through the integument and fascia. Some days after, he was admitted into the Edinburgh Hospital, labouring under a severe attack of erysipelas, with much tension of the limb. I deemed an incision proper, and likely to give relief. A bistoury was drawn in the direction of the limb, crossing the original wound. A dresser, who held the foot, more intent on seeing what was going forward than in assisting, as is often enough the case, allowed it to escape: the man threw his limb suddenly and forcibly in the air. The knife was dropped, but the instant rush of blood covering the by-standers showed that mischief had been done. The foot was now secured, the femoral artery compressed, and the incision prolonged in the fascia and

betwixt the extensor of the great toe and extensor communis, so as to expose the vessel fully. It was seen to be perforated by a longitudinal incision of from two to three lines, which gaped very little, if at all; on relaxing the hold on the vessel in the thigh, the blood gushed out in great force and in immense volume. Ligatures were passed and tied above and below the opening, and all did well.

The edges of oblique wounds, as seen in experiments on animals, are separated considerably, but not to such an extent as those across the course of the vessel. The degree of gaping in transverse wounds depends upon the extent to which the parietes are cut; an incision, for instance, involving a third of the canal will be seen to give rise to a round opening; one involving two-thirds causes a large oval opening, and the flow of blood will bear



some proportion to the shape or size of the aperture. The partial division of a vessel is attended with a more continued and profuse flow of blood, and is consequently more dangerous than a complete solution of continuity; contraction of the extremity of the artery, the withdrawal of the injured part within its sheath, coagulation around the orifice and within its canal, the processes by which bleeding is arrested spon[illegible]posed sur[illegible], not take place unless it is cut completely a[illegible]vessel, and gives vessels are occasionally torn, in consequence of [illegible]lot; this latter of the parenchymatous structure of organs. T[illegible]rely betwixt the this circumstance may be guessed at by the pal[illegible]o arrested may, and the absence of reaction. These effusion[illegible]quence of dege- great extent, and prove rapidly fatal. Lacer[illegible]e whole or of the arterial trunks, with open wounds, are often[illegible]s equally under great or fatal effusion of blood; the external [illegible]en stopped arti-

elongated and brought to a point, whilst the internal coats are torn at various places, and puckered up within the external one, so as to close the canal of the vessel and afford support to coagula; permanent closure of the vessel will often follow. Lacerations from an altered state of their coats, and consequent obstruction, is met with in the large vessels, generally of those advanced in life, but occasionally also in young persons. Several vessels may be affected in the same subject, without assignable cause; this accident may be supposed to have happened when coldness and lividity of the limb, and stoppage of the circulation in the principal artery and its branches are observed. A feeling of uneasiness, and a sensation as if something had snapped, may have been felt by the patient at the obstructed point. Mortification, more especially of the lower limbs, is apt to follow this occurrence.

Mr. Crisp, who is in practice at Camberwell, was so kind as to take me to see a young woman, whose leg he removed on account of mortification following closure of the femoral artery. The vessels of all the extremities appear to have become closed after an attack of inflammatory action in their coats, a sort of general arteritis. No pulsation can now be felt in any of the arterial trunks of the upper or lower limbs, and there is difficulty in keeping up their temperature. The case, a very interesting one, is published in vol. I. of the Lancet for 1836, page 534. This occurrence may often be attributable to a diseased state, a rigidity, brittleness, and alteration in the tissues composing the arterial tubes.

Wo[illegible] of the large vessels, and even of those of the second class, relief. A bisto[illegible]tly mortal, more especially if the solution of con- the original wo[illegible]ernal parts is free and extensive, and if the vessel seeing what w[illegible]vided. If surgical assistance is to be of avail, in enough the cas[illegible]t be promptly afforded. If the blood does not suddenly and fo[illegible]antity, and very suddenly, syncope may ensue. instant rush of[illegible]then in a great measure suspended, its force at mischief had be[illegible]hing; coagulation occurs in the wound, an op- artery compress[illegible]ed of effectually and permanently staying the

hæmorrhage; or it may be repeated in the commencement of reaction and a fatal result ensue. Death will, in some circumstances, follow the division of one or more vessels of the second or third class, within a very short period; this happens now and then in suicidal attempts, when only the lingual and superior thyroid, with their branches, are divided: and I have related, in the "Elements of Surgery," a case of immediate and fatal hæmorrhage from wound of one internal mammary artery, without opening of the chest. The wound of a vessel, without a patent and direct external opening, is attended with loss of blood; but great part of it may be collected in masses, the cellular substance being broken up, or it is extravasated extensively into the intermuscular tissue and sheaths; this may occur to such an extent, as to choke the circulation of the limb and terminate in gangrene, the more so in advanced life, and in the lower limbs, particularly if accompanied by other lesions. Or the tissues may become condensed around, so as to limit the effusion; this coagulates in part, some of it becomes absorbed, but the blood still escaping gives rise to pulsation, the swelling gradually increases, and a circumscribed false aneurysm is thus established. When a vessel is cut entirely across, effusion of its contents may cease spontaneously, and a natural and permanent closure ensue. The retraction and contraction of the vessel, as above noticed, are followed by coagulation in the sheath, and in the canal of the vessel, to some extent, often to the first branch of any size given off above the wound. This clot forms a temporary barrier, lymph is forthwith poured out from the cut end of the vessel and its sheath, and from the surrounding exposed surface; the deposit is organized, seals up the end of the vessel, and gives support to the internal conical and bloody clot; this latter gradually diminishes in size, and disappears entirely betwixt the thirtieth and fiftieth days. The bleeding so arrested may, however, recur at some distant period, in consequence of degeneration of the wound, a sloughy condition of the whole or of the deep parts involving the vessel. This happens equally under some circumstances, when the bleeding has been stopped arti-

ficially, as when spontaneous cessation has occurred, and this may arise from general or local causes, from the state of the atmosphere, the condition of the patient's health, or the nature of the wound. If a vessel of any consequence has been interested, the flow of blood, primary or secondary, may be either furnished by the upper or lower orifice, from that pointing from or to the heart.

The pathological changes on vessels cannot well be entered upon here very fully. As a consequence of degeneration of the arterial coats, aneurysm follows in the vessels of the neck and extremities; these are remediable by the surgeon, and demand operative procedure; even some aneurysms of the trunk may thus be successfully treated. The names of Scarpa and J. Bell, of Abernethy, Astley Cooper, and Mott, will long stand pre-eminent, as having improved our knowledge of the pathology of these diseases, extended the means of cure to cases formerly looked upon as hopeless, and thus materially benefited mankind.

The progress of an aneurysm, when once fairly formed, whether it arises from wound, from yielding and dilatation, in the first instance, or from rupture of the internal coats, and ecchymosis, is uninterrupted and its increase gradual; occasionally, a spontaneous aneurysm, and even a false one, though that is indeed rare, ceases to pulsate, and a cure may fortuitously occur, the tumour gradually disappearing by the absorption of the coagula and the obliteration of the sac. The coagulation and subsidence of the tumour may sometimes be attributable to the operation of external causes, to pressure on the tumour, or to partial and temporary interruption to the flow of blood. One of the very first cases of interest, presented at the North London Hospital after it was opened, (Nov. 1834,) was one of aneurysm at the bend of the arm, following venesection. The patient had consulted Mr. Wardrop on account of this affection, and was, by him, put under my care. The tumour was as large as a pullet's egg, pulsated distinctly, but not so violently, Mr. W. stated in consultation, as it had done; the tumour had also become somewhat painful, was more incompressible than it had been, and could not

by any means be fully emptied. This change had suddenly taken place, and was attributed to pressure, which had been made both upon the tumour, and in the course of the brachial artery. It was determined, under these circumstances, to wait and watch the progress of the disease, and we had the satisfaction to notice the complete condensation of the tumour, the cessation of the pulsation, and its gradual disappearance. This man came to the hospital two days ago with a companion who had got drunk, and injured his head; I examined his arm, and begged of him to return to show its condition to the pupils: he did so yesterday, (May 17th, 1837,) at the visit, and exhibited the limb quite sound, the pulsations in the vessels quite free and natural; strange to say, there appears to be no obliteration of the vessel, at the bend of the arm. There is a specimen in the museum of University College, presented by Mr. Oldknow, then a celebrated surgeon at Nottingham, of false aneurysm at the bend of the arm, which underwent a spontaneous cure. The remains of the sac, cut off from all connexion with the artery which is pervious is seen betwixt that vessel and the vein. It is almost obliterated and contains a small coagulum.

A cure of aneurysm, whether false or true, can scarcely be expected to take place unless from an operation, by which the flow of blood into the sac is interrupted or weakened. The course of the circulation is thus directed into other channels, and coagulation of the contents of the sac, and in the vessel, to some extent, is permitted to take place. The formation of aneurysm from wound may sometimes be prevented by the immediate adoption of proper means, and this leads to the consideration of the steps to be taken to arrest permanently the flow of blood from large vessels, under different circumstances.

The management of hæmorrhage from the smaller vessels, in ordinary solutions of continuity, has been treated of in the first chapter. An open vessel in a large wound can be seen and laid hold of by the fingers, forceps, or hook, and surrounded by a ligature. If the vessel has been cut across, the lower end, if it can be found, ought also to be secured. If the vessel is par-

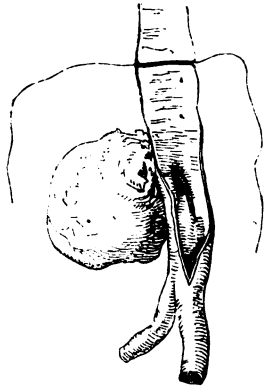
tially divided, it may be a little more exposed by dissection, though not disturbed from its connexions, and one ligature carried under it, above the opening, another below; these are secured; the vessel may then be divided, and the ends allowed to retract, or not, according to the judgment of the surgeon. It is not necessary that this should be done; but if the ligatures be well applied, this step can be followed by no bad consequences. In punctured or indirect wound, connected with open artery, the proceeding of the surgeon will be regulated by circumstances. If blood has flowed freely from the external wound, if the hæmorrhage has taken place again and again to an alarming extent, and is likely to recur, the sooner the vessel is cut down upon, the wounded part exposed, and treated as already recommended, the better. There is no use in waiting for a fresh attack of bleeding. The situation of the wound, and the history, ought to satisfy the surgeon of the line he should take, and that must be adopted at once, without hesitation or delay. It will thus be done much more coolly and satisfactorily, than amidst the confusion and alarm incident upon the hæmorrhagic attack.

If, again, effusion of blood have taken place into the tissues of the limb, around the wound in the vessel, the external opening is small, has healed, or nearly so, and has not for a time furnished blood, then there is no occasion for instant operation. The extent of the effusion, the size and site of the aneurysm, will decide the surgeon as to the proceeding, in the particular case. If the tumour is small and recent, there being little or no coagulum, and the vessel involved is superficial, then the incision may pass through the aneurysm to the point of the vessel which has been wounded. The certainty of a cure will thus be enhanced. If the sac be only filled with fluid blood, and the anastomoses are free, there is risk of a return of the pulsation, or a continuance of the disease, if one ligature only were applied. Nothing here contra-indicates the incision on the injured part. But when the tumour is large, and of some standing, ligature of the trunk betwixt it and the heart, will in all probability be followed by a successful result, and the operation will be attended with less difficulty and risk, under the cir-

cumstances, than would be the incision of the sac, and the groping amongst disordered parts, for the open vessel. In punctured wound, penetrating an arterial trunk, and before extravasation has occurred, the opening may be so closed as to prevent the formation of a false aneurysm; this is effected by nicely-adjusted pressure.

In order to be in a position to make sufficient compression at the wounded part, the surgeon must give uniform and equable support to the whole limb below. The fingers or toes, as the case may be, are separately rolled, the hollows of the hand or foot are padded, and the pads retained by bandage. This is carried up to the wounded point, one compress after another, firm and graduated, is placed on the wound, (on which pressure with the thumb has been regularly kept up,) and these are secured by turns of the roller. The limb is placed in an elevated position, and preserved in a state of repose. The pressure must be kept up for eight or ten days at least. This may have the effect of causing agglutination of the parts around the wound, and in connexion with the vessel, the opening in it may be closed; or if the pressure is well applied, and kept up, and the wound in the artery has been considerable, obliteration of the canal may result. Unless the plan is adopted before ecchymosis around the vessel has occurred, it will not be effectual in preventing the formation of aneurysm. When once this has formed, when the edges of the opening are smoothed and rounded off, by the escape of blood, pressure will afford little chance of benefit, and not infrequently it is prejudicial, from causing excoriation and slough of the integument and sac, followed by troublesome hæmorrhage, if the surgeon is not upon his guard. The annexed sketch represents perhaps as small an aueurysm as is to be found in any collection. It is one of three days' growth, and formed under pressure, applied too late, and in a slovenly manner. The patient, a middle-aged woman, was brought into the Royal Infirmary of Edinburgh, under one of my colleagues, in consequence of dreadful injury of the chest, and also of the head. She was bled at the bend of the arm by one of the dressers. The brachial artery was noticed

to be wounded, but some hours elapsed before pressure was made on the part. The woman died, within four days, from the effects of the injuries for which she was admitted. The vessel and aneurysm are here shown of the natural size.



The wounds, aneurysms, and operations on particular vessels, now demand attentive consideration, and first those of the neck and head may be treated of. Wounds of the carotid and its primary branches, are often enough presented to the surgeon. The external wound is generally transverse, and gapes widely when the head is thrown back. The hæmorrhage is always abundant, the blood, from the vicinity of this region to the heart, flowing out with great impetuosity. When the common carotid is cut, there will seldom be a chance of giving assistance. If it happens that a medical man is on the spot, when the wound is inflicted, he would be to blame if he did not, with his fingers, seize and compress the ends of the vessel, and take means for the permanent arrest of the flow. There is no occasion for any incisions or dissection; by position the parts can generally be sufficiently exposed, so as to allow the ends to be drawn out, or the vessel to be surrounded by one or more ligatures. The bleeding can be commanded for a time, by placing the thumb firmly over the vessel, as it emerges from the chest, betwixt the sternal origin of the sterno mastoid and the trachea. The smaller vessels are to be similarly treated as they present themselves, and the patient watched when reaction commences, so that they may be all noticed and secured. The surgeon in such cases will find the advantage of being provided with a pair of spring artery-forceps, such as are in constant use at the North London Hospital; the catch is small, and does not hold till the forceps are firmly closed upon the vessel. For ligatures of vessels in any situation they are preferable to all others, but when the surgeon is so situated, that he can command no assist-

ance, they are quite invaluable; these little instruments are very perfectly and correctly manufactured by Messrs. Philip and Whicker, (Savigny's,) St. James's Street.

Wounds of the neck require particular notice, as regards the dangerous consequences arising from the implication of the air-tube, and the means of obviating such. In Chapter XI. information on the subject may be sought. Punctured and penetrating wounds of the neck, involving the common carotid, or its branches, require to be attended to. If there is much external bleeding and threatened danger from extravasation, incision on the wounded part of the vessel must be resorted to. The external wound may be so situated as that dilatation of that would not lead safely to the point. A probe may be passed into its track so as to give an idea of the exact spot to which incisions should lead. The opening in the vessel will, in this way, be discovered; at all events, by relaxing the pressure on the trunk, its situation will probably become apparent enough. Two ligatures are passed round the vessel, and tied one above the other, below the wound; in tightening the noose on this or other vessels, the points of the fore-fingers ought to be used instead of the thumbs—the common practice of those who go awkwardly to work. If circumstances do not demand this early interference, the formation of false aneurysm and a regular operation, for the stoppage of the flow of blood into it, may be looked forward to. Pressure cannot be applied for any length of time, so as to prevent the formation of aneurysm. Larrey relates a case in his Egyptian Campaign, in which a wound of the carotid, or its primary branches behind the angle of the jaw, was cured by pressure. In this situation pressure may be applied methodically and persevered in, by bandaging round the head and knotting the roller over the graduated compresses, or rather turning one head of the double roller back very tightly, in a reversed loop of the other, and repeating this manœuvre again and again. Thus, at least, the external hæmorrhage will be commanded, and an opportunity afforded at a future time, by ligature of the common carotid of getting over all the bad effects of the accident.

Spontaneous aneurysm at the angle of the jaw is not an every-day occurrence, and few cases are recorded. The signs of aneurysm in this situation cannot well be mistaken. A tumour progressively on the increase, at first compressible, diminishing under pressure, pulsating violently, and throughout its whole extent, at the margins as well as in the centre, the pulsation ceasing, and the swelling subsiding in whole, or in part, (according to the size, duration, and quantity of solid matter, the layers of lymph and coagulum it contains,) when pressure is made on its proximal side is undoubtedly aneurysmal. Some one or two of the signs may exist, in deep-seated tumour or abscess, lying close upon this or other large vessel, the absence of others and unequivocal ones will decide the question. The existence of aneurysm, in the upper part of the superior triangular space of the neck being ascertained, the surgeon must consider what steps are to be taken to obtain a cure. This is now, thanks to Sir A. Cooper, a matter admitting of no doubt. The ligature of the common carotid, has by that most distinguished surgeon, been placed amongst the regular operations. Before undertaking any operation for aneurysm, more especially by ligature of a vessel near the heart, it will be advisable to see that the circulation is in a quiet state; and if not contra-indicated, it may be found a safe precaution to diminish the quantity of circulating fluid by one or more venesections beforehand, and by a strict diet. The effects of disturbing the flow of blood to the brain was much dreaded in earlier times. This disease was looked upon as irremediable, and the patient left to his fate. A case is given by J. Bell, in which, so late as about the year 1807 or 1808, a poor woman was allowed to perish by hæmorrhage from the sac, under the eyes of himself and colleagues, a whole college of surgeons, at that particular period claiming to be surgeons to the Royal Infirmary of Edinburgh. Both carotids have been tied in the human subject, with but a short period of time intervening, and without any bad effects arising. Sir A. Cooper, still as zealous as ever in the advancement of science, has, by experiments on the lower animals, shown the effect of interrupting the flow of blood in all the vessels

supplying the brain, to be immediate suspension of respiration and circulation. But the ligature of one vessel after another, carotids and vertebrals, giving time for the anastomoses to become enlarged, though evidently productive, for a time, of annoyance and uncomfortable feelings to the animal, was ultimately perfectly recovered from. The paper on this subject, and the drawings in the Guy's Hospital Reports, must, to those who have not had the good fortune to examine the magnificent preparations illustrative of the subject, prove exceedingly instructive and interesting.

The common carotid can be exposed by an incision through the skin, platysma-myoides, and fascia of the neck, without much difficulty or risk. For this purpose, the patient should be placed recumbent, with the head thrown back, and the face turned but a very little to the sound side. The instruments that may be required, and which should be at hand, are a small scalpel or two, good dissecting forceps, two copper spatulas, each about an inch broad, a slightly-curved aneurysm needle, well blunted, and with a round opening close to the point, sufficient only to receive the ligature of strong stay-silk or thread, with which it is armed, and a few armed suture-needles to complete the apparatus. Sponges and lint are not to be forgotten. A director is omitted, as being very useless, and what is worse, its employment being likely to lead to mischievous laceration of the tissues, and disturbance of the vessel from its connexions; neither is that absurd tool, a blunt silver knife, another refuge of piddling and unsteady operators, admissible into the apparatus of a right good surgeon. An incision of from two to four inches long, according to the depth of the vessel, is made over its course, the middle point, if possible, (the size and site of the aneurysm, or wound, will however determine this,) being placed over the place where the omo-hyoideus muscle crosses the sheath. The first incision should penetrate the skin, platysma-myoides, and superficial fascia. The head may now be turned a little, and slightly bent forward in order to relax the sterno-mastoid, so that the cellular tissue lying over the deep fascia and sheath may be raised with the forceps, and divided; or

it may be cut with the hand unsupported, the blood that oozes out being absorbed by an assistant with a bit of soft sponge.

The fascia is cut in the same way, the border of the omo-hyoideus is exposed, perhaps turned up a little with the handle of the knife, the branches of the descendens noni being carefully avoided. The artery is now seen distinctly, the sheath being opened on its fore-part, so as to show about half an inch of its anterior parietes. The par vagum is discovered outside and betwixt the artery and internal jugular vein. The point of the aneurysm needle is passed betwixt the nerve and artery, very slight lateral motion being given, and it is slipped behind without force, until its point is felt on the mesial side by the fore-finger of the left hand, which is pressed upon it, so as to make it separate the cellular tissue; the loop of the ligature thus conveyed into sight, is seized by the forceps or a small blunt hook, pulled through a little, and the needle withdrawn upon the ligature. The loop, or bight, is then cut, and one end withdrawn; the ends of the ligature are held in one hand, whilst with the fore-finger of the other, the vessel is compressed against the loop, and the effect upon the aneurysmal tumour noticed; if satisfactory, the ligature is forthwith secured by the reef-knot, represented in p. 32. This must all be done without disturbance to the vessel, without detaching it from the sheath, or breaking up its fine cellular connexions laterally and behind, farther than is barely sufficient for the passage of the needle. There must be no

lifting of the vessel on the handle of the knife, or on the director, as in triumph at the almost unexpected success in finding it. This practice seems still to be followed, and is even yet represented in the plates accompanying some surgical works. Those who teach or countenance proceedings of the kind, must have paid but little attention to the physiology and pathology of the circulating system, and must have had but small opportunities of witnessing surgical practice. The ulceration of the vessel and secondary hæmorrhage on or about the separation of the ligature, are the almost inevitable consequences of the practice here reprobated.

The vessel being secured, the pulsation arrested, the size of the tumour diminished, and the feelings of tension and pain, which are often highly distressing, relieved, the edges of the wound are put together by one or two points of suture, both ends of the ligature being brought out in the middle of its track; cold water is applied, and after a few hours, a strip or two of isinglass-plaster may be laid across the wound; the stitches may remain, for some days, if they do not seem to excite irritation. The ligature generally separates about the fifteenth day, then the trifling discharge that oozed along it ceases, and the parts become consolidated. The disadvantages attendant upon the practice of cutting the ends of the ligature close to the knot, of applying more than one, (a practice which, however, ought still to be followed, whenever by any awkwardness the vessel is much disturbed from its cellular connexions) the folly of applying ligatures of animal matter, catgut, fish skin, &c., in the hopes of their disappearance by the action of the absorbents, are now, it is hoped, fully known and appreciated. The effects of the operation now described on the tumour, the consolidation of its contents, the change upon the collateral circulation, prepared so far by the obstruction caused by the disease, are now also well understood. The carotid has been tied, with the view of diminishing the swellings composed of erectile tissue of large size, or occupying situations from which they could not be wholly extirpated, as the antrum or orbit, and sometimes with very

favourable results. The vessel has also been secured, in cases of hæmorrhage from the cavities of the face. The operation has been resorted to, in order to arrest the growth of tumours of the face and jaws, for which purpose it must be ineffectual; and it has also been performed as a preliminary step to the removal of such diseases. The suffering of the patient is thus much prolonged, without his safety being at all enhanced, or the dissection of the tumour in any way facilitated. The flow of blood is quite as effectually commanded by pressure with the fingers on the common carotid of the affected side; pressure on both at the same time has given rise to most alarming convulsive movements in some cases, after great loss of blood had occurred. Even pressure on one trunk is not demanded in many of the operations in question. I believe I have had fully as much experience in the management of tumours of the mouth and jaws, and of the face and neck as any surgeon in this country, and have never seen occasion to tie the carotid previous to or during the operations for their removal; and have never regretted omitting this supposed precautionary measure.

The arteries running to the thyroid body have been tied with the view of diminishing the hypertrophy, by which it is sometimes affected, but no good purpose has been answered by such proceedings. The operation, as not very likely to be repeated, does not "merit mention" here. The primary branches of the external carotid are often involved in wounds, and are exposed and divided in operation, so as to require ligatures. The common trunk of the internal maxillary and temporal, has been tied previous to the removal of tumours, but the same objection as that stated in regard to the preliminary ligature of the carotid, here holds good; it is an unnecessary complication of the proceeding. I have often tied it after disarticulating the lower jaw, instead of securing the various branches; it is easily exposed in the lower corner of the wound, by finding the posterior belly of the digastric and the styloid process, so that a ligature may be thrown around it. The lingual artery may be tied by cutting through the skin, anterior border of the platysma-myoides, and superficial fascia, upon the os hyoides, and dissecting in the course of the vessel, as it lies along

the superior aspect of the bone. The tendon of the digastric and lingual nerve, which lie higher in the neck, are separated from it. The incision should run from a little below the symphysis of the jaw, over the corner of the os-hyoides, and to the border of the sterno-mastoid. The cases requiring such an operation must be rare. On one occasion, I tied the vessel of each side, on account of an erectile tumour involving the tongue: the operation was so far successful.

The branches of the temporal are the subject of surgical operation; blood is sometimes abstracted from them; troublesome ulcer, with repeated attacks of secondary hæmorrhage, and false aneurysm, are not unfrequently the result, and attributable, in some instances, to bad management. In the first place, then, as to the operation of arteriotomy. The propriety of taking away blood from this vessel in particular cases, in preference to abstracting it from the general mass of circulating fluid by opening a vein, cannot be discussed here; as a mode of local bleeding it is certainly to be preferred to the scarification and cupping of the temples. This last is more painful and produces deformity; the same troublesome consequences, besides, result occasionally as from arteriotomy. It is not long since I assisted my colleague, Mr. S. Cooper, in operating on a case of aneurysm of the anterior branch of the temporal, consequent upon the application of the cupping-scarificator.

If it is deemed advisable to take blood from the temple, the most full and prominent branch of the artery, the middle or anterior, is chosen; it is fixed, and the skin prevented from sliding upon it by the fore and middle finger of one hand, placed firmly above and below the point intended to be opened. A lancet, the handle at an obtuse angle with the blade, held firmly betwixt the thumb and fore-finger, is pushed through the integument until its point enters the vessel; the object must be to cut it about half across, and to make the opening in the skin about twice the size of that in the deeper parts. With this view, the handle is raised and the blade carried forwards, the point being stationary, so that the opening may be sufficiently enlarged, by the shoulder of the instrument, in withdrawing it; no obstacle will thus be

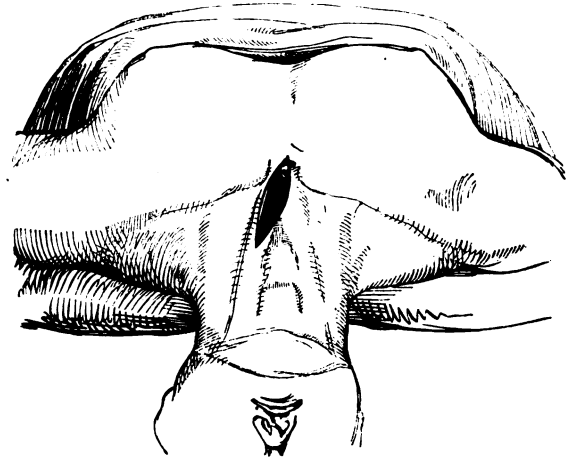
offered to the free escape of blood. If blood flows freely, good and well; if it should not, owing to the insufficiency of the opening, the extravasation into the cellular tissue, or the smallness of the branch, a cupping glass may be applied with good effect, the lower edge being raised, so as to permit the onward flow into that part of the vessel included. The desired quantity being obtained, the bleeding is arrested by placing the finger upon the vessel above the ear; if the branch is small and the stream of blood has not been forcible, pressure may be safely relied on; but if the hæmorrhage continues with impetuosity on withdrawing the finger, it will be the safest plan at once to divide the artery completely; this is effected by again introducing the lancet and making the deep incision of corresponding extent with the external one, by a movement of its point; the ends retract and soon cease pouring out their contents. The edges of the wound are now put together by the finger and thumb, and small, firm, graduated compresses applied and retained by a narrow double-headed roller passed a few times round the head; this should not be removed for at least forty-eight hours. During unhealthy seasons, from improper application of pressure, or of irritating plasters, after this little operation, ulceration over the vessel is now and then set up; the ulceration either commences in, or affects, the vessel secondarily. The consequences are occasional oozing of blood under the dressings, at first in small quantities, a puffy, œdematous state of the cellular tissue, with swelling and redness around, then more violent and alarming hæmorrhage to syncope, repeated from time to time. Pressure cannot be made upon parts so diseased, nor would it be effectual if applied to a vessel in that state. An extensive incision must, without hesitation, be carried in the course of the artery, through the infiltrated tissues, and down to the fascia of the temporal muscle, or the coverings of the frontal, or parietal bones, according to the situation of the bleeding point. By this proceeding, the vessel will, in all probability, be divided on each side of the original wound, and each open extremity can then be laid hold of and secured by the artery-forceps or hook, or it may sometimes be necessary to surround them by ligature, carried in a

sharp needle fixed in a handle, or by the common suture-needle, if nothing else is at hand. A surgeon should accustom himself and be ready to make use of whatever apparatus he can most readily command at the instant; for in unpremeditated operations, the most choice instruments for any purpose cannot always be had. If a man has studied operations, and knows well what should be done under different circumstances, he will generally accomplish his object with very simple means, and make one instrument serve a variety of purposes.

Aneurysm, then, follows accidental or intentional wounds of the branches of the temporal; the pressure may have been so applied, as to favour the closure of the wound, in the super-imposed parts, whilst the blood still oozed out into the tissue around the vessel; a sac is soon formed, and pulsating tumour appears, emptied by pressure upon it, or upon the vessel towards the heart. Ligature on the proximal side cannot be depended upon for a cure, the sac often filling again by the free anastomosing branches. The best practice is to cut through the tumour, exposing the vessel to some extent, and to apply a ligature on each side of the opening; after these operations the wound is encouraged to discharge, and heal by granulation.

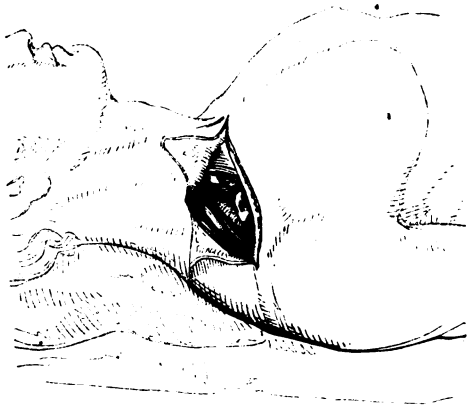
The arteria innominata has been cut down upon and tied on the living body, but without ultimate success, by Mott, Graefe, and Lizars; recourse to this operation may be demanded in consequence of aneurysm of the right carotid descending low, or of aneurysm of the subclavian, occupying the inferior triangular space of the neck. Spontaneous aneurysm of the carotid commences generally near the bifurcation, as do aneurysms in all vessels, and it is only when long neglected, when the tumour has attained a large size by the yielding or bursting of the sac into the cellular tissue, and consequent extension of it, that it can occupy so much of the superior triangular space, as to preclude the possibility of securing the common carotid. If aneurysm of the right subclavian is so situated, or so large as to render impracticable the application of a ligature outside of the anterior scalenus, then it will be a safer and better practice to deligate the anonyma, than to attempt the ligature of the subclavian close to its

origin, and amidst the numerous branches given off from it. The operative procedure is not more difficult, and the chance of permanent obliteration and cure of the aneurysm far greater; on this account it is preferable, the more so when we keep in view the risk of wounding any of the important parts by which the former vessel is surrounded, at the particular point, such as the vagus nerve, the recurrent, phrenic, the branches of the sympathetic, the subclavian vein or pleura. There is little chance of coagulum forming on either side of the obliteration caused by the ligature. In cutting down upon the arteria innominata the patient should be placed upon a table, and the parts on the fore part of the neck put upon the stretch by position of the head and shoulders; an incision should be commenced from the near right sterno-clavicular articulation, and carried upwards, a little to the inner side of the margin of the left sterno-mastoid muscle for about three inches through the skin and superficial fascia, in order to afford ample room for the prosecution of the deep dissection; a second incision may be made, if necessary, from over the sternal origin of the right sterno-mastoid muscle, to meet the lower end of the first incision at nearly a right angle; the flap of integument and subjacent fatty matter is turned back, and the dissection is cautiously pursued through the deep cervical fascia, to near the origins of the sterno-hyoid and thyroid muscles. If there is a want of room felt in the deep incisions, the risk of which is much



obviated by placing the first incision a good deal to the left of the mesial line, the sternal origin of the right mastoid muscle, and some of the fibres of the hyoid muscles may be divided; the commencement of the right carotid will thus be exposed, which will become a sure guide to the vessel sought: it is to be carefully cut upon, and the ligature carried round it. The simple needle, already described, will answer the purpose; but in case of difficulty arising, in consequence of the depth and narrowness of the wound, it is well to be provided with a very admirable instrument, invented and manufactured by Mr. Weiss, for the purpose of surrounding deep arteries by ligature, or with the needle used by my friend, Dr. Mott, who was the first to practice this operation. Each is so contrived that the point, after being felt under the vessel, can be laid hold of and detached from the stalk of the instrument; the contrivances by which this is effected, are simple and ingenious.

The subclavian arteries may require ligatures to be placed upon them, in consequence of true or false aneurysm in the axilla, the lower these are placed and the smaller their size, the more simple will be the proceeding. It is a matter of no small difficulty to get down upon these vessels, more especially the left, when the tumour has bulged somewhat under the clavicle, and when, from the size of the swelling, and in order to relieve the pain and numbness of the limb, consequent upon the pressure on the axillary plexus, the shoulder has been long retained in an elevated position. In performing this operation, the patient should be recumbent, and in order to facilitate the deep dissection, the limb of the affected side should be as much depressed as possible, and the head turned somewhat to the opposite side; an incision is forthwith to be made upon the clavicle, along its whole course, and through the skin put upon the stretch, being pulled downwards by the fingers of both hands of the assistant-surgeon; the integument is now allowed to resume its place, so that the incision traverses the inferior space of the neck; a second incision, carried along the outer border of the mastoid muscle, is made to fall into this. The superficial muscle, fascia, and fatty matter, are turned aside with the integument. Why these



should be divided upon a grooved director, and cautiously as directed, and taught in the schools, puzzles me much. Why great caution should be observed in cutting the fibres of the platysma-myoides, what risk can arise in this stage of the proceeding, I, for one, cannot discover: great caution, great coolness and steadiness, are assuredly necessary in the after parts of the proceeding; but even the most delicate and dangerous parts of the operation can be got through safely and cautiously, without this favourite instrument, and without any tearing, burrowing, or poking, with blunt tools. The coats of the vessel are not so delicate or fine as that they will yield to a scratch with the point of the knife, and if this is used delicately and with a steady hand, no risk can accrue from cutting down to the vessel, instead of scraping a hole towards it. The vessel, as regards its chance of assuming a healthy action, will be left in a much better and more satisfactory state, after the one proceeding than the other. The external jugular vein crosses the space and is easily recognised; it will generally be possible, by dividing the cellular tissue on its mesial aspect, to draw it to the outer side of the wound, out of harm's way; it sometimes, however, lies so much in the direct course of the vessel, that it cannot be so disposed of; if it cannot be held to either side of the wound, it must be divided, and either compressed or surrounded by a fine temporary ligature. The loose tissue filling the space is now divided, the posterior belly of the omo-hyoid muscle exposed, the deep fascia covering it cut on its inferior aspect; with a copper spatula this also is pulled

to the outer and upper side of the wound, and the supra-scapular artery towards the clavicle with another. The outer or distal edge of the scalenus anticus can now be felt or seen, the branches of the brachial plexus come into view, and by dissecting down carefully on their fore part, the vessel can be discovered, and even brought a little into view, as it lies on the first rib, where it emerges from under the insertion of the muscle into that bone. The aneurysm-needle is now passed down with its convexity forwards, and by gently insinuating its point, it may be brought over and behind the artery: if foiled in this, it must be passed in the opposite direction, the point being felt for, and guided by the fore-finger of the left hand; if the point of the needle is properly made, blunt and rounded, and is prudently handled, the subclavian vein lying on the anterior and inferior aspect can be in no danger. The ligature being conveyed, some difficulty may be experienced in drawing it with sufficient tightness; it may be found impossible to reach the vessel with both fore-fingers; as a substitute for this a serre neaud may be used, a strong wire perforated or notched at one end: one only or two of these may be employed, or a double one, according to the judgment of the operator; of course, before securing the vessel definitely, it will be but right to ascertain the effects of tightening the ligature. When the wound is very deep it is no easy matter, for pulsation is an uncertain guide, to ascertain exactly what may have been exposed and taken up by the needle. It happened to me in one of the operations which I performed for axillary aneurysm, and by the way it was the first successful one in Europe, at all events in this country, that the inferior nervous band passing out to form the axillary plexus, was surrounded by the ligature; this was soon discovered, and the ligature, still retained, was made to serve a good purpose; the nerve was pulled upwards a little from its situation, so as to admit of the more ready exposure and deligation of the artery. After the operation is completed, the edges of the wound are put together with a point or two of suture, and the limb elevated, so as to favour the return of the blood, and rolled in fleecy-hosiery, or, what is better, cotton wool, retained by sewing a handkerchief round it.

Aneurysms are met with at the root of the neck, and so situated, that there is no possibility of reaching a sound portion of vessel betwixt them and the centre of the circulation, so as to interrupt the flow of blood. It must be kept in mind that aneurysms of the aorta sometimes rise upwards and bulge into the lower part of the neck, and it has happened that mistakes in diagnosis have arisen in this matter; that aneurysms of the great trunk have been taken for aneurysm of the left carotid or subclavian. It has been proposed to treat aneurysms of these vessels close to their origin, by ligature on their distal side. This practice has been followed in a variety of cases, and, in a few with some apparent temporary advantage. The contents of the sac have coagulated to a certain extent. The result of these operations have, on the whole, not been very encouraging; great difficulty has even been experienced, in some instances, in finding the vessel, the carotid or subclavian. When it is recollected that vessels beyond aneurysm of some standing are frequently filled with coagulum, contracted, and in some instances altogether obliterated, it is not to be wondered at that a search for them should sometimes be attended with trouble, and that occasionally no very happy result should have crowned the attempt thus to benefit the patient. This is a proceeding which, in a favourable case of the kind and at the urgent solicitation of the patient, a surgeon might be induced to adopt, as the only though desperate remedy for an otherwise incurable disease; it is an operation, however, which he would not be warranted in urging a patient to submit to.

In all spontaneous aneurysms in the axillary portion of the brachial artery, the ligature of the vessel above the clavicle is the proper remedy. But it may be the surgeon's duty to cut down into the axilla, to tie some portion of the artery, on account of hæmorrhage from wound, or solution of continuity, caused by sloughing or ulceration. The upper and more especially the lower portions of the vessels may, with great facility, be included in a ligature. The middle portion is so involved, in its normal state, with the veins, that it can be got at with

difficulty. But, in such cases as require operative procedure, this would form no objection to the application of ligature. To expose the axillary artery immediately on the distal side of the clavicle, it is necessary to divide the pectoralis major to some extent, and to separate its fibres from the bone. An incision should be made, immediately under the bone, from near its sternal end, to the space betwixt the pectoralis major and deltoid. The muscular fibres are then cut through to the same extent, the cephalic vein and thoraico-acromialis artery being drawn to the outer side, and protected by a copper spatula. The cellular tissue and fascia are then to be carefully divided, the vein drawn towards the chest, the upper end of the pectoralis minor dissected a little, pulled downwards, and the needle passed. The lower third of the axillary portion of the brachial lies very superficially, and can be reached by abducting the arm, at the same time supinating and bending the fore-arm, by which means the nerves will be put less upon the stretch. An incision of about three inches long is made upon the packet of nerves and vessels, the fascia covering them is divided, the median nerve and axillary vein are separated and held aside by narrow bent spatulas. The artery so exposed is freed by the point of the knife, on each side, from its accompanying veins and tied; of course, in these operations the application of two ligatures will be made, when both ends are open, in order to prevent the danger of hæmorrhage when the collateral circulation becomes fully established.

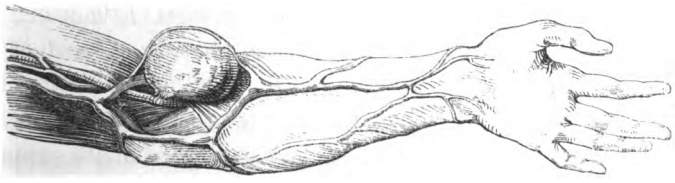
The humeral artery may come to be tied, for wound in the upper-arm, or it may be proper to cut down upon and put a stop to the circulation through it, in consequence of aneurysm of considerable size at the bend of the arm. Disease of the coats of the arteries of the upper extremity, to a great extent, is not common, and very few cases of true aneurysm lower than the axilla are met with or mentioned in surgical works. The surgeon will accordingly seldom be called upon to perform any operation for spontaneous aneurysm (aneurysm from disease of the coats) at the bend of the arm. I have treated but one such case in the person

of an old ship's carpenter. Whilst at work as usual, he felt something snap in his arm, a pulsating tumour was soon after noticed, and before I was asked to see him, by Mr. Cheyne of Leith, it had attained, during four months, fully the size of a hen's egg, and was evidently in part made up of solid matter. The brachial was tied, and everything went on favourably.

The ligature of the artery in the middle of the arm is also the most advisable practice for aneurysm at the bend of the arm, the consequence of careless venesection, when the tumour is of some standing, has attained considerable size, and has become, to a certain extent, incompressible. The ligature of the brachial, in this situation, is not so easy as a young surgeon might suppose from observing its very exposed and superficial position. The skin should be freely divided over it, on the inner side of the belly of the biceps; the fascia is opened at the same time, to the extent of at least three inches; the branches of the internal cutaneous and the median nerve are avoided and pulled to the inner side, the fore-arm being bent, so as to relax them; the vessel is then exposed and separated from the accompanying veins. In performing this operation, the surgeon must have a full recollection of the varieties in the distribution of the arterial branches in this situation, of the high divisions, &c., and he must assure himself, before permanently tightening his ligature, that he has got it round the vessel that is implicated in disease. The consequences of transfixion of the vein, the median basilic, and accompanying punctured wound of the artery, vary according to the steps taken immediately after the occurrence, and according also to the size and direction of the opening in the artery. If the puncture in the artery is longitudinal or slightly oblique, and pressure methodical and sufficiently firm is made upon it, as described at p. 156, the fingers and fore-arm being previously bandaged, as represented at p. 62, the probability is that the openings in both vein and artery will close, and the continuity of the vessels not be destroyed. The same favourable result may even follow in mere puncture across the course of the artery;. but if the artery is cut half across, or more, the effusion of blood

externally and into the cellular tissue, may be prevented, but the pressure must be very well applied indeed, and long continued, to prevent the formation of aneurysm, and the canal of the vessel will be certainly closed.

False aneurysm is the most common form of disease following the accidental wound of the artery at the bend of the arm.

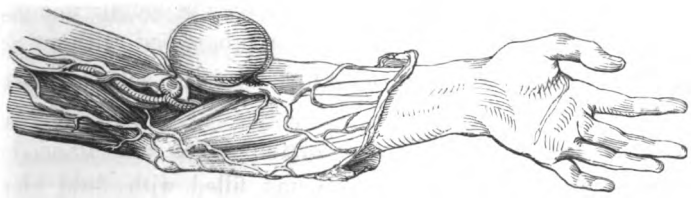


The vein is, as here seen, stretched over the fore part of the sac, compressed, and perhaps obliterated. The cicatrix appears stretched and thin on the surface of the tumour, and there is sometimes a degree of blueness and discolouration around. The progress of the tumour is steady and uninterrupted until operative procedure is resorted to. When the tumour is yet recent and small, and quite compressible, it disappears entirely on the stoppage of the circulation. I prefer, and should advise, that the artery be cut upon and tied above and below the opening in it; this will certainly be more successful than the ligature on the vessel above, in this stage. I have been obliged to resort to this practice in cases where the humeral had been previously secured on the proximal side, and where this operation had proved insufficient to cause coagulation in the sac, in consequence of the free anastomoses. The vessel lies here very near the surface, the skin is cut through over it on the ulnar side of the biceps and its tendon; in doing so on the dead body, the veins and branches of the cutaneous nerve may certainly be dissected and avoided; when the operation is required on the living body, the parts are displaced and matted together, the vein is attached and incorporated with the sac, and no dissection of the coverings of the tumour is admissible or advisable. An incision in the course of the vessel is at once made into the sac and beyond

it on its proximal and distal side, to the extent of nearly three inches. The circulation is commanded by an assistant, who presses with his fingers on the brachial. The opening in the vessel is soon made to show itself, when the cavity has been sponged out. A probe is passed into the opening upwards, and a little dissection of the sheath and venæ comites will then enable the surgeon to pass a ligature under the vessel where its connexions are undisturbed. The same process is followed in regard to the vessel below the opening; there is no risk of interfering with veins or nerves, large or small.

If the artery happens to be wounded in opening a vein at the bend of the arm, and the circumstance has not been noticed in consequence of the flow of blood not being impetuous and per saltum, the opening being probably small, or in the direction of the artery, and the ordinary figure of 8 bandage applied lightly, as after venesection; or if the existence of wounded artery has been known, and inefficient means adopted to restrain temporarily the circulation in the part of the vessel implicated; then there is a chance of a communication betwixt the two vessels being kept up. The opening in the dermoid aspect of the vein, and in the integument, closes as usual; no extravasation takes place betwixt the vein and artery, and their coats become firmly agglutinated. The opening is soon rounded off, is perhaps slightly enlarged, and becomes permanent. The arterial blood is poured into the vein, at each contraction, in a small and forcible stream, occasioning a peculiar thrill and sound; the veins appear to be over-distended, and, for a time, there may be slight swelling and discolouration of the limb. The inconvenience arising from this state of matters is trifling and soon ceases to be felt; no interference is necessary. This is properly aneurysmal varix.

But aneurysm may form in communication with the vein, and two cases of this kind are recorded. This is, properly, varicose



aneurysm, a disease which is oftener talked about than understood. This form is treated in the same way as the false aneurysm in its early or more advanced stages, by ligature at the wounded part, or in the middle of the upper arm. Necessity for ligature of the brachial may also arise in consequence of wound of the palm, involving the deep or superficial palmar arches, or on account of spontaneous aneurysm in this region—a most uncommon circumstance. My friend Mr. Grainger, of the Borough-school, mentioned a case to me which had come under his notice; and his colleague, Mr. Pilcher, who indeed had the principal charge of the patient, has been kind enough to favour me with some memoranda concerning it.

Case.—"A working goldsmith, about forty years of age, of a gouty diathesis, had a tumour formed beneath the ball of the right thumb; it was mistaken for an abscess; on careful examination, I discovered it to be an aneurysm, and believed it to be situated between the adductor pollicis and abductor indicis, and to be a disease of the radial artery at its terminal division, probably induced by the repeated, though slight, blows from the handle of the hammer, which his occupation constantly obliged him to use. I proposed to tie the radial and ulnar arteries immediately above the wrist, provided the ligature around the radial was ineffective in diminishing the tumour and arresting its pulsation. My expectations were realised; the closure of the radial artery was attended with diminution in the size and pulsation of the tumour, but still both remained to rather less than half the

previous degree. I immediately tied the ulnar, when the tumour was much reduced in size, and the pulsation completely: slight secondary hæmorrhage occurred from one of the arteries at the seat of the ligature two or three days after the operation, which was arrested by cold water; the case progressed without any further untoward symptom, and was attended with a perfect cure."

Here success followed ligature of the radial and ulnar, but there was a risk of the tumour being filled with fluid blood through the inter-osseous. I should, I must confess, have had recourse to ligature of the humeral low in the arm, had such a case been presented to me; and even now, after knowing the successful result of Mr. Pilcher's practice, it would be a matter for consideration, whether or not one operation only, and one which would effectually for a time weaken the circulation in the principal vessels, should not be preferred. Of course, were the division high, the branches must be found, and tied above the bend of the arm; the same incision as that already described would suffice.

Recent hæmorrhage from the palm must be commanded by ligature on the divided ends of the vessels, exposed farther, if need be, by dilatation of the wound. If the bleeding has been at first commanded by pressure, as it may be permanently, when but small twigs are implicated, and blood bursts out impetuously again and again, after the tissues have been altered by inflammatory swelling, abscess and infiltration of blood, then should the clearing out of the wound, and methodical pressure from the bottom of the cavity not prove effectual, recourse should at once be had to the operation on the brachial. There is no use in trying to include the vessels, even could they be got at readily and safely in the palm; they will not hold a ligature when in this state for any time, nor can ligature on the radial and ulnar be relied upon. Pressure on the vessels is sometimes resorted to in such cases, and in such a way as to operate upon their course, part of the circumference of the limb being uncompressed. Ring tourniquets, as they have been called, are invented and

sometimes employed for the purpose; the veins cannot entirely escape obstruction, and the effect of this upon the diseased parts must be apparent. It is a remnant of the old and barbarous surgery. The practice may be successful at a time, and by chance, but if generally employed it must lead to mischief in the deep parts, bones, and joints, and dependence cannot be placed upon it for a cure. The ligature of the vessel under very unfavourable circumstances, might, after all, be called for, or even the amputation of the member.

The radial and ulnar arteries may be the subject of injury and operation in various parts of their course. When wounded, the opening in the coverings being free, and the hæmorrhage profuse, the ends may at once be pulled out and tied. Should the external wound have been closed, and aneurysm formed, it will not probably be permitted to attain any great size, that of a filbert or small walnut is the average, before assistance is sought for. The tumour in that case is to be opened by a free incision in the course of the vessel, the hæmorrhage commanded, and, by careful dissection, the vessel exposed above and below the opening, and at these points tied. I have secured the radial and ulnar in all parts of their course for small aneurysms. Anatomical knowledge does assuredly avail much, but no regular dissection, turning aside the nervous twigs, and cutting the sheath on a director, as described in the various manuals of operative surgery, can ever be observed in actual practice; he who puts faith in what is taught by writers and professors, who have learned their surgery only in the dissecting-room, will, when cases are presented to him, demanding these irregular operative proceedings, find himself very much at a loss how to proceed. The radial artery may be the subject of operation, as it passes on the dorsum of the hand, betwixt the metacarpal bones of the thumb and fore-finger. It is cut upon on the ulnar side of the extensor of the second joint, and tied either above or below, where it is crossed by the tendon, as may be. We have no choice as to the point of deligation, for we have absolutely nothing to do with these vessels, in surgical practice, unless wounded, and then only at the wounded point. In

making the incisions, and in separating and tying the vessel, care must be taken to avoid parts of importance, not to detach the artery from its connexions further than to permit the application of the ligatures, and to include nothing but the vessel, neither accompanying veins nor nerves.

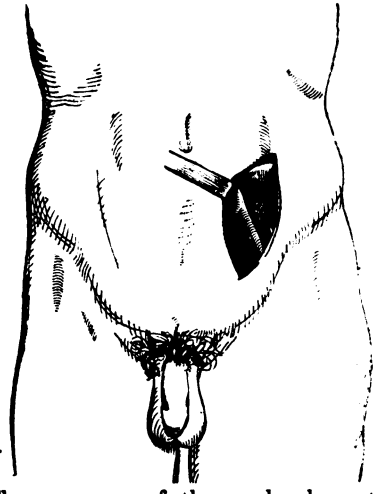
At various points on the thenal aspect of the fore-arm, the radial artery must be exposed. The skin and fascia are to be divided very freely; at the lower part, the incision is carried on the radial side of the flexor carpi radialis; higher up the deep incisions must be guided by the ulnar edge of the supinator radii longus. The deep fascia is cut open, the sheath of the vessel exposed, the veins which invest the vessel, and one of which often lies on the fore-part, are separated. The musculo-spiral nerve lying behind, is scarcely in the way. The injured part of the vessel can thus be reached at any point without much lesion or disturbance of other organs.

The ulnar artery may be tied on account of bleeding, primary or secondary, or when the subject of false aneurysm anywhere in its course, as it lies on the fore-part of the wrist and palm inside the pisiform-bone, and it can be secured before it dips to meet the other vessels under the palmar aponeurosis. In this situation I have had occasion to tie the vessel more than once. It is readily reached in the fore-arm, by cutting freely along the radial side of the flexor carpi ulnaris; the ulnar nerve is easily recognised, detached as much as sufficient, and held aside. The needle may then be passed betwixt the artery and nerve, from the ulnar to the radial side. Near the elbow-joint, the vessel lies deep, and can only be reached by cutting the muscular fibres, and detaching the connexions of the flexor carpi ulnaris and flexor digitorum. Should the ulnar artery be here wounded, and I am not aware of any such case having occurred, the probability, owing to its great depth, and the nature of the coverings, is that the blood would not escape freely, and that a circumscribed false aneurysm would form. The prudent practice would be, to permit this to attain considerable size and consistence, and then secure the humeral portion of the brachial. The proceeding would be less severe

than cutting up and crippling the muscles of the fore-arm, and in all probability it would prove quite successful. I have had occasion to tie the ulnar rather above the middle of the fore-arm, and there it can be reached without much difficulty.

The aneurysms of the groin and hip were looked upon as mortal and irremediable affections, as were those of the neck and axilla, until my excellent preceptor and friend, Mr. Abernethy, and after him Dr. Stevens, showed that the Hunterian method could be applied, even to these. It is true, that admirable surgeon, Mr. John Bell, had previously with great skill and boldness put a ligature round the gluteal in a most formidable case of false aneurysm. This practice, however, would not have been applicable to aneurysm from degeneration of the coats of the vessel, it being for one reason impossible to say whether or not they had given way within reach from behind; and very few would have been found possessing sufficient courage to repeat the operation, even in a more favourable case than that which occurred to Mr. Bell. The common, internal, and external iliacs, are now tied without much difficulty, and very often with a successful issue. These operations are quite justifiable, provided always, there has been no mistake in diagnosis, that the disease really is aneurysm, and that there is nothing in the state of the patient's health, or in the condition of the arterial system, to contra-indicate interference. With a view of reaching these vessels, the abdominal parietes should be divided down to the peritoneal sac, so as to afford sufficient room for the application of the ligature, and at the same time with as little cross-cutting of muscular fibres and disturbance of parts as possible. The faint-dotted line on the right side of the sketch on the next page marks the course of the first cut; on the opposite side the peritoneum is separated, and along with the abdominal parietes held aside by a spatula, so as to expose the vessels, the common, external and internal iliacs lying upon the psoas muscle. The incision through the skin and superficial abdominal fascia, should pass from over the vessel, as it lies under Poupart's ligament, upwards and somewhat outwards, crossing but in a slight degree the fibres of the tendon of the external oblique.

These are separated, as few fibres being cut as possible. The fibres of the internal oblique, which here descend, and those of the lower border of the transversalis, are also divided with great caution, the finger and forceps being used in raising



them slightly. The passage of the cord, where the transverse fascia is thinned and continued over that body, is carefully opened, and the finger insinuated gently betwixt this layer and the peritoneum. The layers may be cut upwards and outwards, to the full extent of the external wound, and the inner margin of all drawn towards the mesial line, together with that part of the peritoneal sac, separated from the iliac fascia, by moving the fingers gently in the loose cellular connexions. Great assistance in getting to the bottom of the wound will be derived from the use of the copper spatulas already spoken of and recommended. They form flat, blunt hooks of any curve, occupy no room, compared to the fingers of assistants, and prevent the oozing from small branches. The same direction of incision, somewhat extended, will enable the operator to reach the internal iliac, as it lies over the sacro iliac junction, or the common trunk, which is easily found by tracing the external iliac upwards; to get to the latter vessel, the incision should be free, its length depending on

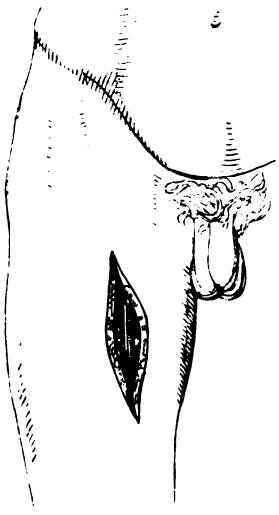
the corpulency and size of the individual, say from four to five inches. An incision of six inches, well placed, will enable the surgeon readily, (as he will find on practising on the dead body, where the steps are essentially the same,) to reach either of the other two vessels with facility. The external iliac is come to at once by opening the fascia transversalis, at what used to be called the internal abdominal ring, outside of the spermatic cord, and detaching the peritoneum slightly. The division of the deep layers, so as to leave the peritoneum sound, is the most ticklish part of the operation, and one requiring great deliberation and steadiness; it is very loosely connected at the point indicated, the transverse fascia is delicate, and, perhaps, in all the incisions of the parietes, whatever vessel it is necessary to secure, this is the point at which the separation of the membrane from its investing sheath should be commenced. The artery is easily detached from the vein, which lies on its inner and posterior aspect, with the point of the knife, by a slight scratch, so as to permit the introduction of the point of the needle, which is brought up on the outer side. The ligature may be passed round these vessels, and secured by the common aneurysm-needle and fingers; but it is well to be provided with the needles and the serre neaud already described. The object of the incision being effected, it is put together by a few points of suture, the limb and abdominal parietes are relaxed by position, and the temperature of the limb attended to and preserved by proper coverings, but not excited.

The common femoral artery may require ligature on account of wound. Its superficial and exposed position, and its connexion with no important organ, save the vein, render its exposure and inclusion in two ligatures an easy enough matter. It has been tied for iliac aneurysm. In one case it was found that the canal had been previously closed by firm coagulum, and contracted in size. This proceeding is not likely again to be put in practice. The superficial femoral is perhaps more frequently the subject of operation, than any other large vessel; it is exposed very often and tied on account of aneurysm in the lower part of the thigh, or popliteal

space; it was to this vessel that the immortal Hunter first applied his principle of interrupting the stream of blood, so as to divert it into other channels, thus permitting consolidation of the tumour, in preference to opening the sac, and attempting to include the vessel in ligatures at the "bursten point." This latter operation had been extensively practised, but with very bad success; so discouraging, indeed, were the results, that many surgeons preferred performing amputation of the aneurysmal limb. The natural obstacles occasioned by the relative position of parts, the depth of the vessel in the then bent position of the limb, were as nothing in comparison to the risk attendant upon making the incisions in altered parts, and the difficulty of finding a sound portion of vessel, to include in the ligature. It is not to be wondered at then, that, almost without exception, the patients subjected to this proceeding perished from gangrene of the limb, or from secondary hæmorrhage. This operation of Hunter, modified and extended by the distinguished men who have imbibed his principles, and followed in his track, has led to many of the most brilliant triumphs in surgery. The aneurysms situated in the lower third of the thigh, where the vessel penetrates the tendon of the adductor magnus, and those in the ham, are readily got rid of by the simple and beautiful proceeding of exposing, by a trifling incision, of from two and a-half to four inches, according to its depth, and of tying a fine thread round the superficial femoral; a proceeding which need not occupy, in the majority of cases, above a couple of minutes. The vessel may also require to be tied on account of wound, or recent false aneurysm, in any part of its course; and, moreover, in order to weaken the circulation of the limb, it may be proper to have recourse to the operation, in cases of alarming secondary hæmorrhage from solution of continuity of the lower part of the limb, in an unhealthy state, or from stumps, in which the process of cure is thus interrupted.

The superficial femoral artery is exposed by an incision, carried along the inner border of the sartorius muscle, in the lower acute angle of the triangular space formed at the top of the thigh. The

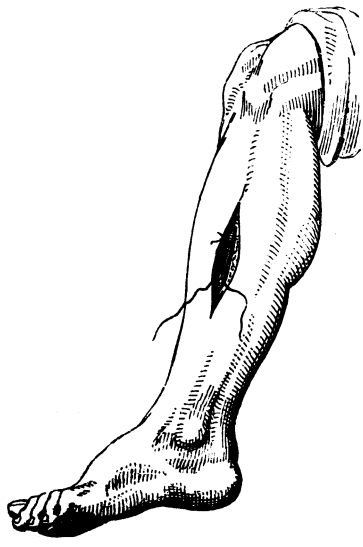
point of election for securing the vessel, is where it begins to be overlaid by the muscle, the edge of which is the best guide. The skin and fascia may be cut through in the first incision, or the fascia may be first exposed, and then opened to a sufficient extent, with the point of the knife, in the hand unsupported. The sheath of the vessels is soon brought into view, some twigs of the crural nerve lying on the fore part, the vein to the inner and posterior aspect. The nerves are avoided, and with the point of the knife a scratch is made betwixt the artery and vein. The needle is insinuated gently betwixt them, or it may with equal facility, and with proper care, be introduced in the opposite direction. The vein must be carefully avoided; if it should be wounded, gentle compression and position must alone be resorted to. Varieties have been met with here in the arterial distribution, and, though such exist very rarely, the same precautions formerly insisted upon, viz. to ascertain the effect of pressure on the exposed vessel, after the ligature is passed and before tying it, is to be observed. Sir Charles Bell met with a double femoral artery, in a case on which he operated, and the vessels and sac are preserved in the museum of University College. The vessel being tied, and the pulsation in the aneurysm stopped, the wound is put together, and the position and protection of the limb attended to. It is well known that the temperature is increased for some time, that pulsation returns feebly after a few days, and generally ceases shortly; that the tumour gradually disappears, and that the ligature is detached some time before the twentieth day. Mortification of the limb sometimes ensues, in which case immediate amputation of the thigh in the middle must be resorted to. It is not at all necessary to go above



the part of the vessel which had been operated upon. The supply of blood, though inefficient to support the vitality of the limb, will amply suffice for the stump. The pulsation returns at a later period in some cases, even at the end of many months, and gains strength. Pressure well applied, the lower part of the limb being supported, will generally answer the purpose of stopping the flow into the still unobliterated sac, and lead to the consolidation of its contents and their absorption. Secondary bleeding may take place on the separation of the ligature, even though well and carefully applied, and without any unnecessary disturbance of the parts. The patient must still be afforded another chance, by the free exposure of the vessel above and below the seat of the original operation; an incision being carried through the cavity in which it lies, surrounded by coagula, and the re-application of a ligature effected on each portion.

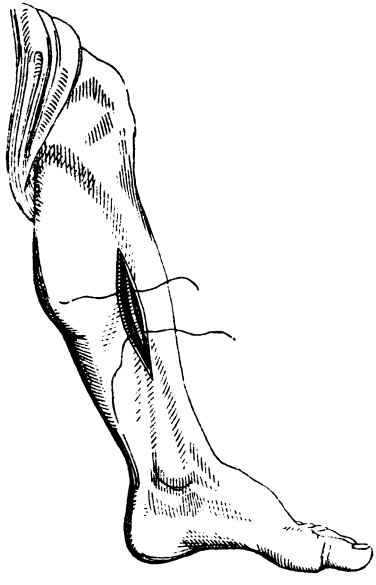
The popliteal artery has very rarely, during the last fifty years, been made the subject of operation; it is not exposed to injury, and when diseased, as already stated, it is in a most unfavourable state to be interfered with; even in its sound state it is reached with difficulty. My worthy colleague, Mr. S. Cooper, lately cut into the popliteal space, and, with some trouble, put a ligature round this artery, on account of secondary hæmorrhage from the posterior tibial, which had been tied several times, but without permanent closure; the hæmorrhage did not return after the last operation, and the sore healed: the case is mentioned in Mr. Cooper's "First Lines." In a similar case I should prefer, as more simple, and likely to be more certain, the application of a ligature to the superficial femoral, in the situation already indicated.

The anterior and posterior tibial arteries must be tied occasionally, above and below the wounded part, on account of hæmorrhage (as in case p. 150) or small false aneurysm. The remarks regarding the injuries of the upper extremity, apply with equal force here. The anterior tibial, in the lower part of its course, lies very superficially; it can be exposed by an incision, of two inches in length,



through the skin and subjacent fascia, on the tibial side of the extensor proprius pollicis; the branches of the peroneal nerve are avoided of course in passing the ligatures. On the fore part of the leg, the vessel can be reached with ease by an incision along the same muscle, and betwixt it and the tibialis anticus. The venæ comites are of course excluded from the ligatures. The muscles should be relaxed after the first incision through the skin and fascia, and the higher the point at which the vessel is to be exposed, the longer must be the incision,—say, from five to six inches.

The posterior tibial may be exposed, as it lies in or above the hollow of the os calcis, by an incision betwixt the malleolus internus and the tendo achillis. The artery is found accompanied by veins, and the tibial nerve lies on its posterior aspect towards the tendo achillis; the tendons of the tibialis posticus, flexor communis digitorum, and flexor proprius pollicis, lying nearer the bones, and bound down in their sheaths; the last-mentioned tendon being somewhat nearer the point of the os calcis than the sheath of the vessels and nerve. A careful separation of the artery is made from the



other parts, and it is tied secundum artem. In order to reach the vessel high in the leg, a very free division must be made of the parts behind the tibia; the incision will pass betwixt that bone and the edge of the gastro-enemius, which is raised and pulled aside; the origin of the solæus from the tibia is cut loose, and the deep fascia divided; the vessel will be found accompanied by the nerve on its tibial side, lying on the belly of the tibialis posticus muscle, and nearly midway betwixt the two bones. The peroneal artery may be exposed, if necessity occur, by a very free incision on the outside of the limb, betwixt the fibula and the tendo achillis, and the muscles which terminate in it; the belly of the flexor proprius is pulled aside outwards, or separated from the bones, and the vessel secured. It has been proposed to remove part of the fibula in order to facilitate such operations, but by cutting the soft parts to a sufficient extent, such proceeding is rendered quite unnecessary.

Solution of continuity of the coats of veins is attended with flow of dark blood, often in great quantity, but the flow is not impetuous; it is easily arrested by position, by raising the bleeding point above the level of the trunk, and by gentle pressure upon the part, or on its distal aspect. The venous branches in the lower limb, enlarged so that their valves cannot act, and deprived of support by destruction of the skin, sometimes give way. The consequence is a rapid and great loss of blood, with syncope, but the flow ceases by raising the limb, and is not renewed when reaction is established, if the patient be kept recumbent; the same results are observed when veins are opened accidentally or in some of our operations.

Dilatation of the trunk and branches of veins, with difficult return of blood, congestion in the capillaries, thickening and alteration of tissue, ending often enough in abscess and ulceration, result from various mechanical obstructions, external or internal, which it is only possible to allude to here cursorily. Such affections are rare in the upper extremity, though I have seen a few cases following violent muscular action. In the lower extremity and at the outlet of the pelvis, around the lower bowel and

genito-urinary organs of both sexes, such congestions are common enough and lead to many of the diseases, which will be noticed in succeeding chapters, as demanding operative assistance. Many of these may be prevented, relieved, or removed by a timely attention to, and abstraction of, the cause; this is sometimes very possible, even when that is situated internally. Through external pressure, the use of tight ligatures, many affections below the knee are caused or kept up; sometimes in hospital-practice, this is found to be done intentionally.

Wounds in veins close readily, and without the deposit of much new matter; when not extensive and in the direction of the vessel, they adhere at once; if extensive and transverse, so that there is some gaping, the opening is filled with coagulum, projecting both towards the canal and outwardly; this is so far diminished by absorption, and latterly it is invested by a thin layer produced from the coats of the vein, and somewhat strengthened by the condensation and adhesion of the cellular tissue. A vein divided across is closed at both ends by the formation of coagulum, and deposit of lymph, but not to the extent observed in the other system of vessels. The closure is sometimes slow and imperfect, and when matter is formed on a surface or in the tissues around the opening, it is apt to be taken up and conveyed into the circulation. When mixed with the blood, the pus is deposited in various situations, in the substance of internal viscera, in muscles, joints, &c. This accident is accompanied by a train of alarming symptoms, almost uniformly ending fatally. The coats of veins do not furnish the same quantity of plastic matter, nor is it so necessary for their reparation as the arteries; but in consequence of injury, they are subject to diffuse inflammation, often running rapidly along the internal coat, and attended with alarming constitutional disturbance. The local results are plugging of the vein by clot and lymph, secretion of purulent matter within their canals, deposit of thin putrid fluid in the investing cellular tissues, erysipelas, and gangrene. Violent and alarming irritative fever attends upon these, and too often terminates in the death of the patient. In our operations, lesion of veins is to be scrupu-

lously avoided, and if wounded, the bleeding must be permanently arrested, if possible, without ligature.

The most simple and trifling wounds of veins are in some states of the atmosphere and condition of the system, followed by phlebitis, always a very intractable disease; this must be kept in view in deciding upon our proceedings, and in determining the mode of conducting them. Operations upon veins (which every one looks upon himself as competent to undertake, and assuredly they are easily enough executed, if one can say so, they are by much too simple, and thus resorted to for want of consideration, or to give time for it, in by far too many instances,) are performed for the purpose of diminishing the quantity and impetus of the blood, or altering its quality. In acute cases instant relief follows the practice; the structure of parts is preserved, and consequences dangerous to life averted. In many cases, however, of a different character, much more harm than good results from the abstraction of blood; congestions are thus increased, and effusions encouraged; after severe injuries, the power and elasticity of the system is too often destroyed, and life extinguished by a rash, thoughtless, and unseasonable use of the lancet. A practitioner ought to think twice of the probable and possible effects in every case of disease or injury, before he determines upon and proceeds to open a vein for the purpose of draining off the vital fluid.

The superficial veins about the ankle are sometimes opened in order to give relief in some affections of the female genital organs, with great advantage. The flow of blood is encouraged by position, and immersion of the limbs in warm water. The veins of the scrotum are sometimes also opened with good effect, for acute inflammatory swelling of the testis. Blood is occasionally taken from the system, by opening the external jugular vein. It is practised in children in whom the veins at the bend of the arm are small, and often concealed by fatty matter. The practice is also, though rarely, followed in the adult on account of head affection. The necessity for the practice being clearly made out, the operation can be accomplished without much trouble.

In children, the vein rises during expiration in screaming; it can be made to appear under the thin coverings of skin and cutaneous muscle, by impeding the return of blood. The thumb of one hand is placed above the clavicle, and with a lancet held betwixt the fore-finger and thumb of the other, an opening is at once made in the coverings and coats of the vessel; the point of the instrument is placed on the skin, (the middle, little, and ring-fingers, resting on the neck, so as to steady the hand,) and made to enter by pushing it steadily, but quickly, forwards, in an oblique direction; the opening in the skin and muscle is enlarged by raising the instrument perpendicularly, and then cutting a little in withdrawing it; the object being to make the wound somewhat of a funnel-shape, the apex being in the vein. The operations upon veins, and in fact upon any part, must not be effected by a random thrust of the instrnment. A punctura can always be made quickly, and with comparatively little pain, but at the same time with steadiness and precision. The quantity of blood being obtained, the pressure below is removed, and the edges of the opening put together by a narrow strip of isinglass plaster.

At the bend of the arm, the median cephalic vein is the one generally sought for, as being removed from the course of the brachial artery. But this venous branch is often small, and cannot be made to appear, or to rise sufficiently on interrupting the flow of blood towards the heart, and forcing the blood from the deep veins, by making the patient throw his muscles into action. In that case the median basilic must be opened, but with due caution; this is done every day without any bad consequences. Puncture of the artery does not happen in one case out of many thousands, in which the vein directly over it, and almost in contact, is opened. The various consequences of this mishap have been explained and shown. Provision being made for receiving the blood, and all arrangements made, the arm is tied up, that is to say, a band, ribbon, garter, or bit of bandage, is passed round the upper arm, about two inches above the elbow; the middle part of it placed on the anterior aspect of the limb, the ends are brought round

and secured by a running noose, these being however twice implicated. It is drawn with sufficient tightness to obstruct the return from, but not the flow of blood into, the limb. This must be looked to, otherwise, after the branches below the ligature have poured out their contents, no more will be obtained, unless the band is so far relaxed. The position of the patient will depend upon circumstances, on the nature of the disease or injury, and on the object the practitioner has in view in taking blood. The surgeon capable of using either hand, will place himself in front of the patient; he will, in operating on the left arm, place the thumb of the right hand firmly on the vein below, where he proposes to make his incision, and holding the lancet in the left hand, as above directed, he will make the opening obliquely across, of the form and extent already indicated. This done, the pressure of the thumb is removed, and the stream directed into the cups or platter held under the arm. The limb is to be preserved in the same position as when the vein was opened, during the flow of blood, otherwise this may be interrupted, by the skin sliding over the opening in the vein. The flow is encouraged by motion of the fingers, as explained above; and this is generally insured by giving the patient some body, as the lancet-case, to turn in his hand. The proceeding is reversed on the opposite side. The surgeon will be regulated in choosing the arm for venesection by the position of the patient and the size of the veins. When the blood has flowed sufficiently, the band is removed, the thumb placed below or over the opening, the arm washed and dried, and the aperture closed by a bit of plaster; or if the bleeding still persist, a small graduated compress is put on and retained by turning the band round the elbow in the figure of 8 fashion, and if need be, knotting it, or turning one end through the loop of the other, and over the compress; this pressure is kept up for twenty-four hours, at least.

Extravasation of blood, thrombus, as it is termed, follows this operation imperfectly performed, when the opening in the vein and skin do not correspond, or are not properly proportioned. Abscess in the cellular tissue may follow ragged wounds, or those

made by instruments in bad order, or soiled with putrid matter. The wounds of tendons do not deserve notice, nor even those of nerves; the former can scarcely be wounded in the operation, and would not, in all probability, if they were, lead to any bad consequence; the partial division of branches of the cutaneous nerves has given rise to painful feelings in the limb, and to general disturbance of the nervous system. Such occurrences are rare, may be treated by general means, or if need be, the original wound may be slightly enlarged. No regular dissection of the bend of the arm, as has been proposed, can ever be warranted; Benjamin Bell would have had one almost sever the extremity by incisions through fascia, muscles, and tendons, even to the periosteum, in search of nerves, which were supposed to have been injured in venesection.

Dilatation of veins has, from time to time, been treated by operations of various kinds, intended to cause obliteration of the trunk, so as to take off the weight of the column of blood from the ramifications, and thus free the patient from the deformity, swelling, ulcerations, and other annoyances, consequent upon that condition of the circulation of the part. It was the practice at one time, to cut upon the saphena vein on the inside of the knee, or thigh, and after dissecting it from the accompanying nerve and cellular investments, to put a couple of ligatures upon it, and cut it across—a very effectual way of stopping the current of blood in either direction; but it was too often followed, and that very speedily, by a permanent arrest of the general circulation, to be persevered in; for many patients perished in consequence of inflammation of the veins so induced. The vessel has been cut across by introducing a narrow knife at some little distance from it, without any division of the superimposed parts; pressure is afterwards applied. This plan, proposed by Sir B. Brodie, and somewhat modified by a Dublin surgeon, Mr. O'Farral, has succeeded in some instances. The vein may be tied without division of the skin, by passing a long fine needle under it, and applying the twisted suture. The needle is withdrawn within two days, so soon indeed as condensation of the surrounding

tissues, and coagulation in the vein to some extent have ensued, and before any ulcerative process has been set up for the detachment of the foreign body. I have had recourse to this method a few times, and, as far as I can judge, the practice is safe, successful, and well worthy of farther trial. Lastly, the vein has been obliterated by the application of the lapis infernalis, as recommended by Mr. Mayo. A bit of paste made up with soap is applied, or a piece of the potassa fusa, of the size of a split-pea, is put upon the skin over the vein, where it is pretty sound, covered by a small piece of dry lint, and confined with a strip of common adhesive or soap-plaster. In a few hours this application is removed, and the water-dressing substituted, as recommended at p. 29. The eschar, which has reached the vein, separates after a short time. The vessel is found to be condensed above and below, the sore heals, and permanent closure, attended with diminution of the varices, is the ultimate consequence. In order to effect this end perfectly, it is occasionally necessary to produce obliteration also of the lesser saphena vein, as it passes towards the popliteal space. The process is not attended with much pain, and there is no great risk of inflammatory action spreading along the coats towards the heart. The inflammation excited is of the adhesive kind, is attended by deposition of fibrine, which is speedily organized, so as to close the canal. I have seen but one case in which the action was diffused; the patient, advanced in life, and of broken constitution, was treated by one of my colleagues in the Edinburgh Hospital. He perished apparently in consequence of the practice; but it was not a fair case to draw conclusions from, unfavourable to the method. The patient must be confined strictly to the recumbent position during, and after, the separation of the slough, and until the breach of surface has become well filled up by granulations, and consolidated. By a neglect of this precaution, patients have lost blood to an alarming and dangerous extent. One stout young woman, to whom I had applied the potass, for the purpose here indicated, chose, contrary to orders, to get out of bed, and remained in the erect position

for some time. She was found in a state of syncope in a deluge of blood; she recovered from this, and in order to prevent a recurrence, to induce again the adhesive process, the exposed vein was touched with a small cautery, pressure was applied, the patient kept recumbent, and the limb elevated. I have heard of similar instances occurring, and it will be always proper to impress upon the patient, the risk of attempting the erect position, for a certain period after this method has been employed. Upon the whole, I should be induced to give a preference to the sutura circumvoluta, as described above, when from the uncomfortable state of the limb, and the occupation of the patient requiring long persistence in the erect position, it is desirable to relieve the varices of the pressure of a great column of blood; more especially when the limb has become swollen enormously, and ulcerated, and when, perhaps, hæmorrhages have occurred from the ramifications of the veins implicated in the ulcerated surface, in spite of methodical support. In the greater number of cases of varix of the branches of the saphena veins, the removal of the cause, accumulations in the lower bowels, tight ligatures, &c., together with the employment of uniform support, will render the patient comfortable, and do away with the necessity for any operations whatever on the veins. A laced stocking, or a piece of the fine and pliable India-rubber bandage, now manufactured in great perfection, may be worn outside the under clothing; when so applied, it does not slip down, nor does it fret the skin.

CHAPTER VII.

ON INJURIES AND DISEASES OF THE INTEGUMENT AND CELLULAR TISSUE.

THE greater number of accidental wounds involve the skin, cellular tissue, and fatty matter only; they more rarely penetrate the fascia, or implicate the muscles. The skin is often stripped from the subjacent parts to a considerable extent, and this is accompanied by breaking up of the cellular connexions, and by laceration of small arterial and venous branches and nervous twigs. The skin may thus hang loose to some extent, or the manifest solution of continuity may be small, whilst by the forcible detachment, by the skin having been made to slide, as it were, to an unnatural extent, on the subjacent parts, a large cavity is left all around. This is uniformly and speedily followed by effusion of blood. This may be termed a compound bruise; the simple variety consisting in the same sort of detachment without wound. The progress of the two cases is generally very different. In the mere simple bruise, as already explained, the blood coagulates in part, but it is still somewhat under the influence of the containing tissues, does not lose its connexion with the system entirely, and is generally removed in a short time, if not interfered with, by the action of the absorbents. In the other case, the air being admitted to the cavity, coagulation almost immediately followed by putrefaction ensues upon the extravasation, and the blood acting now as a foreign substance, must be extruded. Suppuration, at first unhealthy, bloody, and ill-digested, is established for this pur-

pose. The surgeon will encourage this, and may be called upon to give free exit to it by enlargement of the opening, or by the formation of a fresh dependent counter-opening. The more or less bruised nature of accidental wounds, the unfavourable direction of most of them, as stated in Chap. II., where the management of recent solution of continuity in the covering of the body is fully treated of, does away very much with the chance of union by the first intention. The gaping of transverse wounds in consequence of the greater tension and elasticity, or contractility of the skin in the direction of the body and limbs, has already been alluded to.

In accidental wounds, the part implicated is to be relaxed, and displacement remedied by position; any flap so formed and reverted is retained by the mild and unirritating isinglass-plaster; a stitch may sometimes be put in, or a compress and bandage, applied slackly, may be used for the purpose of keeping the parts somewhat in their relative situation; but any attempt to pull them into close contact, and keep them so, in the hope of union taking place, is futile; in fact, the use of any retentive means ought to form an exception to the general rule which should guide our procedure. The sooner discharge is established the better; lint dipped in cold water may be applied for a few hours till the oozing has ceased, and then with the view of promoting secretion of pus, of thus soothing the painful and uneasy feelings, and of preventing extensive swelling, heat and moisture are substituted. A poultice, always a filthy and uncomfortable application from its weight and stench, may be used; what is much better, equally efficacious, and not liable to objection in any way, is a double piece of lint soaked in hot water, of an agreeable temperature, applied to the part; it is covered by an ample piece of oiled silk, to prevent evaporation, and this dressing, simple enough, but answering every purpose, is removed frequently; the lint may be moistened by merely removing the oiled silk, if the parts are very tender, and if it be not soiled by discharges; all the soothing effect of a poultice is thus produced, without any discomfort. This warm water dressing is light and nice, and it is changed often if there be any unpleasant odour exhaled; it may be medicated with extract of poppies, or salts of opium, or it may

be coloured, or have some aromatic added, if the patient does not put faith in simple means. A great deal has been said about water-dressing, and the merit of introducing it; water has been applied to sores from time immemorial. The simple element, water, was supposed to be congenial to wounds and sores; it was used to cool parts. The water-dressing has been used in my hospital and private practice for a long series of years, as a substitute for poultice, as a means of conveying and preserving heat and moisture, on a surface that should secrete pus for its protection, and as an accompaniment of the process of healing by the second intention. A poultice, (the very word is disgustingly associated with putrefaction and nastiness,) has very seldom been employed either in my hospital or private practice, for the last ten or twelve years; in fact, our nurses at the North London have almost forgotten the mode of making the abomination. So soon as the surface is clean, the blood is discharged, any slough of cellular tissue or skin has separated, and the discharge is copious, thick, and bland, the granulations are threatening to become large, then some astringent must be added to the water, at first cautiously and in small quantities, so as to moderate the discharge and keep the granulations in check; such as infusion of roses, a lotion of nitric acid, port wine, tincture of kino, sulphate of zinc, or of iron, or copper; in short, any vegetable or mineral astringent. The lotion most commonly used, and which has taken the place of the healing ointments, (these are now very scarce, and used only to issues and other sores, which it is not desirable to have closed,) is one recommended by that very admirable surgeon and exemplary man, Mr. Hey primus, of Leeds, for the injection of strumous abscesses :—℞. sulp. zinci ʒj sp. rorismarum ʒiss, sp. lavandulæ c. ʒss, aquæ ʒxxx; m. ft. lotio. This red lotion, as it is called, is added to the tepid water in the proportion at first, perhaps, of one part to three or four of water, and gradually increased in strength; this cautious procedure is adopted, lest the discharge should be suddenly suppressed, and inflammation of the surface of the sore, marked by a white and adherent crust, and painful feelings, and of the neighbouring skin, should ensue; if this unfortunately should arise, the warm

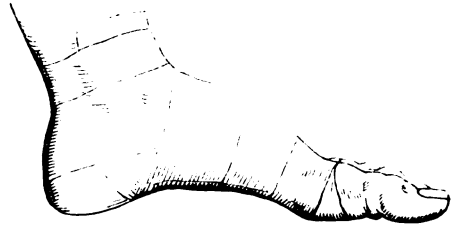
water is forthwith to be gone back to, and perhaps some general antiphlogistic means adopted. Thus the greater number of solutions of continuity can be brought into the state of simple purulent ulcer—a sore which is disposed to, and will speedily, heal. This desirable consummation will be much encouraged by guarding against any congestion in the part, by favouring the return of blood from it, and this can always be effected by proper position. The healing of sores is also much influenced by the age of the patient, the state of his health, and the situation of the breach of surface, as regards its vicinity to the heart. It is often necessary to vary the application to a sore; it may become stationary under the use of any one mode of dressing; the state of the system may require revision, and there is no such index of the condition of an individual as the surface of a sore. An experienced practitioner can learn more from that source than from any examination of the pulse or tongue, secretions or excretions; not that attention is to be thus diverted from such means of information. The stomach and bowels may require being put into good order, and the nature of the circulating fluid, and the functions generally of the animal machine thus improved. The granulations may become too high and exuberant, as is often the case when poultices and greasy applications have been long persevered in; the process of cicatrization cannot proceed. A good mode of preventing, or even of repressing, such a state of the surface in the first instance, consists in dressing with dry lint and bandage; very narrow slips of old linen or cambric, spread with cold cream or some mild and recent ointment, the unguent. cetacei, are first placed on the margins of the ulcer, a piece of dry lint doubled is applied over all, and retained by bandage; or a bit of finely pierced pledget (old thin linen perforated by many holes and thinly spread with unirritating ointment) is placed on the raw surface, and this again is covered with a layer of charpie or soft lint. If this does not suffice after a fair trial, the sulphate of copper should be rubbed on, and effectually once for all. Very exuberant granulations may sometimes be shaved off with a thin and very sharp knife, with less pain than attends their destruction by escharotics.

I am no advocate for meddlesome surgery, the constant pid-

dling with caustics, and the eternal pokings and probings of wounds, abscesses, and sinuses. Nature, well and judiciously assisted, instead of being thus thwarted, tampered, and interfered with, as is too often done by those who must try to cure all diseases and injuries by the pure force of surgery, will generally bring matters to a speedy and happy conclusion. We must, however, try to bring sores into that state in which cicatrization can take place, and this process is equally interrupted by the surface being raised above or depressed beneath the level of the surrounding skin. When the surface is elevated, that state must be corrected at once, and not by constant and painful interference with one stimulant and astringent or another. The sulphate of copper is for this purpose the most efficient, and it should be used as already advised. It is not necessary to rub over the whole surface of a large sore; the application must only be confined to the granulations next to the margin. Time is thus given for the adoption of other means, as the dry dressing and pressure, to suppress the exuberance of the remaining part, whilst the cicatrization goes on from the circumference. Cicatrization, it is well known, often proceeds from points in the centre of a sore and from portions of skin that have not been destroyed throughout its whole thickness. When a portion of skin is removed by accident or design, no such appearance can present. It occurs during the healing of very deep breaches of the surface, but these have been produced by burn, by ulcerative absorption somehow induced, following abrasion or abscess, or injury of some sort, or arising in consequence of the weak, obstructed, and imperfect state of the circulation. The depth of the sore is more apparent than real. The reparative process has been interrupted, granulations have been absorbed, have sloughed away from improper dressings, or if on the lower extremity from long persistence in the erect position; the surface has become smooth, and furnishes no great quantity of discharge; the surrounding cellular tissue is infiltrated by fibrinous effusion as well as by albuminous serosity; the skin is thickened and opened out in its texture, rough and elevated. The surface may inflame, and will then furnish a bloody and

putrid secretion; it becomes deeper and more extensive by ulceration or sloughing, and it is in this state, or after the loss of considerable quantities of blood from dilated veins ramifying in the vicinity, that the patient applies for relief. He has been obliged to undertake a journey, or to be more than usual in the erect position, and he finds that he cannot continue his exertions on account of the aggravation of the disease. Such diseases are only met with in the labouring classes, in the lower extremities, and a great many individuals are so disabled. The excited condition of the parts, the foulness of the sore, is first to be corrected; this is done by attention to the digestive organs, by elevating the limb above the level of the trunk in the recumbent position, and by soothing applications. The bread and water or linseed meal poultice, the carrot poultice, if there is much sloughing or fetor, (if the practitioner or patient have any particular fancy for or faith in them;) or the warm water dressing, medicated or not, may be used. When the surface has become thus florid and clean, the object must be to bring the surface of the sore and that of the surrounding parts on a level. Granulations cannot be made to grow by any known application; the surface has begun to furnish them, but the void cannot thus be filled up by new matter. The swelling caused by the infiltration of the subcutaneous tissue and the state of the skin itself, is to be got quit of, and this is speedily effected, the position favourable to the return of blood being still observed by methodical compression. It is in these depressed and indolent sores that Baynton's bandage, as it is called —the method so used and abused by the Messrs. Scott, so indiscriminately employed I should rather say—is of the utmost advantage. The lower part of the limb, the foot, heel, and ankle, must be supported by bandage. This is seldom done very satisfactorily, and the art cannot be acquired without a good deal of practice and without following a proper plan. The end of the roller is placed on the inner malleolus, carried under the heel and round the ankle once, then passed over the foot, close to the root of the toes, and by two or three turns brought up to the ankle again, over the point of

the calcaneum, being reversed under each malleolus and then turned round the heel in both directions. It is impossible by words to explain this, but it is here shown in two stages of the proceeding. The bandage is carried up nearly to the lower



margin of the sore, in order to prevent swelling, which might lead to the necessity of removing the whole dressing; if this preliminary step (no part of Baynton's or Scott's method, by the way,) is neglected throughout, whilst tight pressure is made round the limb above, troublesome swelling and even ulceration

about the ankle are sure to ensue. The parts round the sore

having been thoroughly washed with soap and water and dried, are encircled by strips of adhesive plaster, about an inch and an eighth or an inch and a half broad. The middle of the strips of plaster, heated, are placed on the opposite side of the limb, and the ends drawn across the sore are laid down. If there is much discharge, it is advisable to cut a small hole in the plaster where it is to cover the ulcer. The strips of plaster are carried from an inch or so below the sore to the same distance above; some tow is placed on the dressing to absorb the discharge, and retained by a few turns of the roller. This dressing is removed at the end of twenty-four or forty-eight hours, according to circumstances; when this is done, the purulent secretion is to be removed from the surrounding skin, by means of a little tow dipped in tepid water. If there is threatened excoriation, soap or spirit lotion, say one part of achohol to six or seven of lime-water, may be also used, but on no account ought the surface of the sore to be interfered with, to be mopped or wiped with sponges, or soused and deluged with water poured from a height. The secretion serves a useful purpose in protecting the part, acting as a cuticle to it; dreadful mischief, to say nothing of the pain, has resulted in hospitals, from the absurd practice of removing it; the indiscriminate and indiscreet employment of sponges has, without doubt, often contributed much to the degeneration of sores, and the spread of contagious diseases, hospital-gangrene, and erysipelas. In warm weather the patient will often find relief from soaking the limb, through the dressings and bandage, with cold water, as recommended by Baynton. So soon as the object for which this dressing has been applied, is attained, the thickening has disappeared, and the surface of the surrounding skin is on a level with that of the ulcer, when in fact the sore has been brought into a simple and healthy condition, then the dry dressing, or the lotions as recommended, may be substituted; but if the sore continues to heal rapidly under the plaster, and the patient feels comfortable, it may be continued with propriety. When it has nearly closed, all dressing may be discontinued, the discharge on the surface may be allowed to dry, and form a crust, under which,

if it adheres, the cicatrization will be completed; or this may be accelerated by rubbing the surface lightly with blue-stone, or the nitrate of silver. The elevated position of the limb is still to be preserved, however, and it will be advisable to insist on the patient afterwards giving support to the surface, more especially if the veins are enlarged, by the use of a laced stocking, or of the India-rubber bandage.

Many solutions of continuity in the cellular tissue and skin cannot be brought into a healthy condition until parts, the circulation of which is weakened, are divided or destroyed. The skin has been thinned, its vascular supply cut off by displacement, or destruction of the subjacent tissue; the edges of the sore are thin, and of a dark red colour, part of the cavity is in a half-sloughy condition, the discharge is glairy and ill-conditioned, and it proceeds from various cavities, communicating with the ulcer, and even from under the flabby granulations which in part occupy the void. The surfaces are not in a state to coalesce. This state of matters is very much altered for the better by the free application of the potassa fusa, followed for a time by water-dressing, and by attention to the digestive organs and to the general health. Again, ulcerations are disposed to spread superficially at one part whilst they heal at another. The margin, when the ulcerative process is in progress, has an irritable and angry aspect, the edge is jagged and surrounded with diffuse redness to some distance; the discharge is bloody, thin, and putrid; the papillæ of the skin and the sentient extremities of the nerves are implicated, and hence intolerable and constant burning pain. These sores occur in different parts of the body, and generally several exist at the same time; they often follow scaly eruptions, and are connected with a disordered and cachectic state of the system; that must be corrected, and the local affection palliated, soothed, and brought into a more healthy condition. The nitrate of silver applied lightly to the unhealthy margin at intervals, and the water-dressing, will often answer well. But it is out of place here to discuss the treatment of ulcers, or to enumerate all the local remedies that are now, or have been, used. Very many of these have been employed to solutions of continuity of every kind, and

at all stages of their progress. A judicious practitioner will, by varying his applications, the actions of which he has become acquainted with, according to the appearance and disposition of the exposed surface, serve and benefit his patient much more efficiently, than by trying, empirically, this or the other new specific, or blindly applying one remedy for every sore, because he has seen its good effects, or been informed of its answering miraculously in one or two instances; the same remark applies with equal force to the indiscriminate prescription and exhibition of internal remedies.

Foreign bodies lodge in the cellular tissue, sometimes cause great pain and inconvenience, and give rise to a process for their ejection. Abscess forms, and progressive absorption brings the collection of purulent matter to the surface; from the cavity the foreign matter may at once be ejected or removed by art, or it may be discovered after a time, by an examination of the sinuous track, or contracted cavity of the abscess. Such is the process also by which dead and useless portions of the machine are thrown out. In many cases foreign bodies, even of large size and irregular shape, needles, pieces of glass, leaden bullets, remain long imbedded in condensed cellular tissue, and give rise to little or no inconvenience, even for a series of years; these often shift their position, they may be lodged deeply, and gradually come towards the surface, and they move from one part to another of the trunk or limbs. Instances of needles, which had fallen into the pharynx, appearing on the surface of the body, are not uncommon. Bullets which had lodged deeply have, after the lapse of years, appeared under the skin and been removed. When the presence of foreign bodies is distinctly perceived, they may be cut upon in the direction of the fibres, and turned out by the use of a scoop or forceps, any important parts being avoided. We are often called upon to remove needles from various parts of the body and limbs, either shortly after they have entered, or at a later period when they have become oxydised, and adherent to the surrounding and condensed tissue. There is a difficulty oftentimes in feeling their situation distinctly, in satisfying oneself of their presence. If there is any doubt in the

mind of the surgeon, he had better not make incisions and subject the patient to unnecessary pain, and himself to the risk and disgrace of failure. No harm can accrue from small foreign bodies remaining, and the chance is that sooner or later they will become apparent, so as to be certainly and easily removed. A very small incision will sometimes enable the surgeon to reach one end of the needle; it can be pushed through the opening, so as to be seized with forceps, the opposite extremity being fixed by the fingers, whilst the incision is being made. When the point is unbroken and the foreign body is recently and favourably lodged, incision is sometimes unnecessary; the head of the needle, or part corresponding to it, being pressed so as to bring the point through the integument. I have removed many needles from the upper extremity in this manner.

The mode of evacuating abscesses has been fully adverted to in a former chapter, and the propriety of making the openings free and dependent in the direction of the fibres, was insisted upon; the mischievous effects of squeezing out the matter was also alluded to. There can be no greater cruelty or folly than that of pressing the sides of a suppurating cavity together, to empty it of its contents; the surfaces are thus excited, air enters to fill the vacuum so caused, violent pain is produced, inflammatory action is lighted up, the discharge becomes vitiated, bloody, putrid, and profuse, and the constitutional disturbance is often alarming and even fatal. One or more sufficient and well-placed openings are made, and the discharge allowed to be gradual; a warm poultice of linseed or barley-meal, or of bread soaked in hot water, covered for a few minutes and not broken down, is applied for a few hours, and this is renewed frequently, and soon replaced by the elegant substitute for a poultice, the tepid water-dressing. The necessity for making incisions and counter-openings, the mode of doing so in order to prevent cavities, and permit fistulous tracks to close, has also been fully noticed; free division of such canals is occasionally required, as when one side of a cavity is movable, the other being fixed; or when the action of muscles interfere with the process of contraction. Dressings, lint smeared with ointment or oil, or dipped in water, must, after

such incisions, be applied to the bottom of the cavities, and betwixt the edges of the recent division, and retained until discharge is furnished by their surfaces. The frequent repetition of such dressings is not necessary.

The incisions for the evacuation of putrid matter and sloughs, as in carbuncle, are suited to the particular case. They must be made free and sufficient, even by cross-cutting, for the purpose of exposing the unsound parts, so that proper applications may be made. This is not the place to treat of the general management of such cases.

Great deformity is occasioned by the displacement and fixation of parts, in consequence of the formation and subsequent contraction of cicatrices. The free motions of parts of the face, of the head or limbs, is sometimes destroyed by the contraction of scars, more especially of those extensive ones, following the destruction of the surface by the application of heat. The eyelids are often everted in consequence; the eye thus exposed is liable to inflammation and opacity: the under-lip is turned down, so that the saliva cannot be confined. The chin is tied to the sternum, or the head fixed to one side by firm, white, and corrugated bands. The upper extremity is often so disabled; the upper arm is confined to the chest, or the fore-arm is fixed to the upper-arm by a dense and unyielding web. Sometimes the hand is awkwardly twisted, and rendered comparatively useless. In some favourable cases advantage may arise from the division of such bands, or from the removal of part of the cicatrix, means being taken, by various contrivances, to keep the parts separated during the healing, and divert the renewed disposition to contract, to more favourable position. There is no great encouragement to make such attempts; certainly no severe operation is warrantable, and, as already said, it is only in favourable instances, when the connecting slip is thin, and not extensive, that any permanent advantage can be expected from interference with it.

Various parts of the integument are subject to disease, some not very manageable, even by the most persevering and judicious

general treatment. The inflammations of the skin, accompanied by infiltration into the cellular tissue, and great tension, can in many instances be relieved only, and the destruction of the tissues prevented, by free incisions. These incisions are carried merely through the affected parts, the skin and cellular substance; it is only in very aggravated and neglected cases that the intermuscular tissue and deep parts are involved. The incisions are made where the tension is greatest; in advanced cases, the experienced surgeon will at once detect any situation where the cellular tissue is most infiltrated, broken down, and likely to be the seat of abscess or sloughing, and that he will choose for his opening. One or two incisions well placed, and not very long, will suffice in general, to afford relief, and avert mischief. The propriety and effect of this practice has been long appreciated.

In 1748, Mr. Freke, then surgeon of St. Bartholomew's Hospital, thus writes: "Scarifying the skin in a gangrene is a very idle practice, unless the surgeon, if he hath sagacity enough, when the membrane is not destroyed, but only ready to suffer, then cuts largely through both, and thereby lets out the inflamed juices, which distended it, and by that means takes off its tension. In such an act he shows both judgment and resolution; such good treatment continued, may cure the patient." Nothing can be more clearly, or more forcibly indicated, than this practice of incision, to avert the formation of matter, or the accession of gangrene, not to evacuate the secretions or dead parts, after actions have been permitted so to terminate.

In many cases when this practice is advisable, the loss of blood cannot be borne to any extent. Care must therefore be taken, by position of the limb and gentle pressure for a time, to guard against such accident. Incisions will be required on the limbs, trunk, or scalp, and their direction must always be the same, their extent and number being regulated by the nature of the case, the violence of the action, the degree of swelling and tension, and the period of the case. The incisions are best made with a broad bistoury, and according to the rules already laid down. It has been proposed to employ the cupping-scarificator for the

purpose of dividing the vessels on the inflamed surface; this practice is not now followed. Sir R. Dobson, the able head of the surgical department of Greenwich Hospital, many years ago recommended the practice of making numerous punctures in rapid succession, with the point of a lancet; in milder cases, where there is little or no infiltration into the cellular tissue; and in cases of erysipelas of the face, where incisions cannot be practised with propriety, it is a proceeding which answers admirably; it supersedes entirely the very questionable mode, in these cases, of extracting blood by leeches. When advisable, the bleeding from punctures may be encouraged by making the part dependent, or, as in the case when an extremity is affected, by interrupting the return of blood by pressure for a short time. Fomentations will always be found soothing and grateful after incisions or punctures.

Some parts of the skin and cellular tissue are subject to hypertrophy. The follicles are enlarged, the tissue is thickened, the venous ramifications are enlarged and loaded. The cellular tissue is infiltrated with albuminous serosity, and even more solid and organized deposit is often found to have taken place. The supply of blood is not large in proportion to the bulk of the swelling. Enlargements of this nature occasion great deformity and annoyance. Temporary swelling from effusion into the cellular tissue and rugosity of the skin, accompany disease of long standing in other tissues. But it is met with more especially in warm climates, as an idiopathic affection. The lower extremity and the scrotum are the seat of enormous growths; the Barbadoes and Cochin legs are of this nature, affections sometimes, though very rarely, seen in the natives of this country. A similar swelling is met with in the external labia; and the disease in the coverings of the nose is by no means uncommon here. The mode of freeing patients of such excrescences will be noticed in Chapter IX.

CHAPTER VIII.

ON RESTORATION OF LOST PARTS.

Surgeons are too often asked to admit, that operations are the opprobria of their art, and there is not much room for dispute, when the "cruelties" practised are to save life by mutilation of the body. But even then it is unjust to sneer at this department of the profession, as is done by some, affecting to consider the dexterous and successful operator as little better than a "clever butcher." For, at the worst, the operation is but the lesser of two evils, and the man who can skilfully avail himself of this choice, saving his patient from death, though in so doing much suffering be inflicted, and the appearance, and even utility, of the body be impaired,—that man is entitled to the esteem and honour which ought to attend on talent and worth, exercised in a good cause, equally with the most refined and delicate conqueror of a fever or ague, by elegant and agreeable ptisans.

But when the object of the operation is not to mutilate but to repair,—not to deform, but to restore lost appearance and symmetry,—not to cripple or destroy, but to restore lost functions and capabilities,—then does the "deed of blood" rise high in the scale of good actions, beyond the cavil of all whose opinion is worth attention. To this happy class belong the topics now for consideration.

RHINO-PLASTIC OPERATIONS.

The nose is frequently destroyed in whole or in part, and from various causes; external violence, intractable ulceration in youth, syphilitic or mercurial ulceration, frost-bite, &c. In this country ulceration is usually the destructive agent.

Such an accident, however occasioned, entails on the sufferer the utmost misery. The organ impaired, being so prominent and important a feature, the unseemly breach is observed by all; the patient consequently shuns society and every appearance in public, and often is oppressed with a self-loathing and abasement, almost amounting to the blackest despair.

Were those who seem to despise the repairing of such deformity by surgical interference, holding it as a frivolity and little better than operative quackery, to witness the utter wretchedness of the mutilated object, and how eagerly he would cling to any hope, however slender, of bettering his condition, prejudice against rhino-plastics ought rapidly to thaw before the warmth of aroused feelings of humanity. If not, put the scoffer in the place of the patient,—let him lose his nose, reputably or otherwise, allow him some weeks of consequent misery and degradation, then bring him in contact with a skilful and dexterous surgeon, who despises no part of his professional practice that is to benefit his fellow-creatures, and thinks it not beneath him to make noses as well as stumps, and there can be little doubt that ere long the rhino-plastic art will have obtained an addition to the list of its supporters, of a sure and zealous proselyte.

It is not surprising that at an early period of surgical science, attention should have been turned towards repairing deficiencies of the nose; we are only astonished by the reflection that it is comparatively but of late that any decided approach towards perfection has been made in this department. The tardy progress is to be attributed partly to the apochryphal character which the first attempts acquired, and partly because the important doctrine of adhesion was for long but little understood or attended to.

The first recorded attempt at restoration of the nose was made by a surgeon in Sicily, towards the middle of the fifteenth century. At the time, it seems to have attracted some notice, and to have been followed by similar attempts both in Sicily and Italy. But comparatively little was known of any such proceeding till about a century later, when, under the fostering zeal of Tagliacotius, rhino-plastics at length attained celebrity. Tagliacotius and his followers, who were tolerably numerous, adopted without improving the old inconvenient method, borrowing the repair from a distance, and consequently rendering the proceeding tedious, most annoying to the patient, and liable to failure. The integument and cellular tissue necessary for their purpose was taken usually from the upper part of the fore-arm; this substitute "was not applied immediately, but was detached gradually, and allowed to thicken and change its consistence, and to become more vascular, previously to adaptation to the mutilated organ. When considered sufficiently prepared (seldom in less than fourteen days) it was shaped so as to fit accurately, though still remaining attached at one point to the arm; the cicatrised edges of the deficient parts were then made raw, and the new substance was affixed by suture; the original attachment was preserved entire, and the patient kept in a constrained position, the arm and head being approximated and bound together by apparatus for many days till union occurred; then the flap was separated entirely, and the new nose moulded into its proper form by subsequent paring and compression."—(Elements of Surgery.)

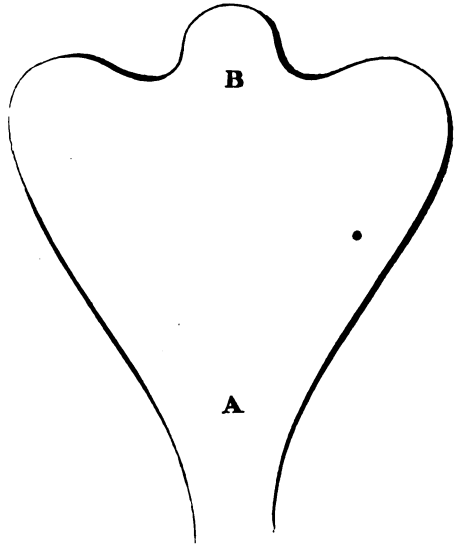
This mode of operation, with all its defects, struggled into notoriety; but no trial of it was made in this country. An unusual caution seemed to possess the Britons; for even after their attention had been directed to the subject, the whole was treated with ridicule, and regarded as fabulous, handled with the licentia poetarum, and dressed in an extravagant, though less decorous garb; its improbability has been made a point of keen and humourous satire by Butler in the imperishable "Hudibras." But though inaccessible to innovation of this nature from the continent, they

did not neglect similar results of experience communicated from a more distant clime.

In India, during the war with Tippoo Saib, in 1792, several individuals who had been cruelly deprived of their noses during captivity, had that organ restored, successfully and dexterously, by a Mahratta surgeon. This led to inquiry, and it was discovered that the operation had been practised in that country "from time immemorial," chiefly by the Koomas, a caste of Hindoos, whose dexterity and success cease to be matter of wonder, when we consider the ample practice they enjoyed, the system of punishment incidental to the country, supplying numerous patients. This mode of procedure was very different from that of the continental surgeons; they obtained the substitute from the immediate neighbourhood of the lost part, from the forehead. To Mr. Carpue our profession is indebted for the introduction of this operation, by his work published in 1814—15. Since then it has gradually gained ground, and is now of no unfrequent occurrence.

RESTORATION OF THE WHOLE NOSE.

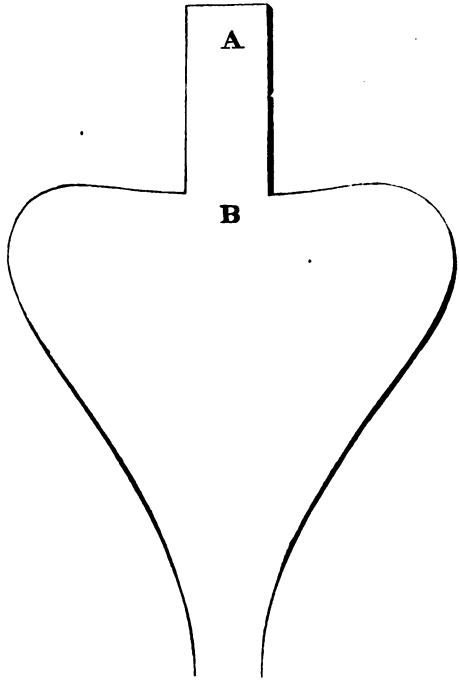
The operation of restoring the whole nose, in substance the Indian, but modified, is performed as follows:—the cicatrized remains of the old nose are pared down to a considerable depth, to produce a raw surface on which to attach the flap from the forehead. A piece of soft leather, cut to the shape and size of the integument required to replace the apex and alæ, (see fig. in next page) is placed flat on the forehead. (A being between the eyebrows and B towards the hairy scalp.) To secure accuracy in the line of incision, its boundaries are marked on the skin with ink, in case the patient prove unsteady. The flap, being thus defined, is dissected down, and kept of uniform thickness, till near the lower angle, when the incisions should be carried deeply so as to insure an abundant vascular supply. Care should be taken, however, to avoid the periosteum, otherwise exfoliation may follow, which would increase the scar, and render the cure tedious. This



narrow part of the flap, or attachment, at the root of the nose, must be of some length to allow of its being twisted so as to bring the integument to the exterior when the part is adapted to its new situation; and to facilitate this, the knife should be carried a little lower down on that side on which it is intended to make the turn. "After the bleeding has ceased, the flap is retained in apposition with the raw edges of the truncated organ by points of suture; a little oiled lint is placed in the nostrils to support the flap, but no other dressing should be applied. To cover the part with adhesive strap, and pledgets of lint smeared with ointment, can answer no good purpose, and the subsequent removal of such might endanger the adhesion."—(Elements of Surgery.) The surgeon should be in no hurry to fix the flap; for union is most likely to occur when bleeding has ceased, and the edges of the wounds have begun to assume the glazed appearance which precedes secretion. The lower part of the wound in the forehead is brought together by suture; to the rest, lint moistened with warm water, and covered with oiled silk, is applied, the lint being re-wetted from time to time. Granulation soon diminishes the raw surface, and cicatrisation is expedited by the stimulating

lotions suitable to the circumstances of the sore. As for the nose itself, "the lint may be removed in three or four days, and then too some of the stitches may perhaps be dispensed with. The flap will be found adherent, but loose, and raised by every expiration. Very soon granulations rise from the inner surface, the part derives support from below, and becoming firm preserves its form well. It will be necessary during the cure to keep the nostrils of their proper size and shape, by means of well-fitted tubes."—(Elements of Surgery.) When the nose is firmly consolidated, and has established a collateral circulation, so becoming independent of the supply through the twisted attachment, this is divided, a bistoury being passed beneath, to remove a wedge-like portion, and so admit of the front being laid down smoothly over the root of the nose, where it is retained either by gentle pressure or by suture.

In this manner is restored the main body of the organ, the



apex and alæ. Now we have to turn our attention to their support, and a subdivision of their front, by means of a columna. This the Indians obtained by bringing a slip of integument from the forehead, along with the rest of the flap, as represented in plan in preceding page.

B forming the apex of the nose, whilst A is turned down and fixed to where the original column rested. Until lately, this mode of operation was pursued in this country; but it is liable to much objection. In most cases, the hairy scalp must be interfered with, in order to obtain this part of the flap; and from its form and relative situation, its vascular supply must be so impaired as to render its failure, in the support of its new character, not at all unlikely, by sphacelation; indeed this has not unfrequently happened. Besides, it has not sufficient solidity to support the apex of the nose; on the contrary, it bends, shrinks, and pulls the nose downwards. I have found it much better to divide the operation into two parts; first forming the main body of the nose, as already described; and after this has become consolidated and healed, then raising a columna from the upper-lip, as I have elsewhere described, thus:—

"Restoration of the columna is an operation which, in this, and other civilized countries, must be more frequently required than the restoration of the whole nose. This latter operation came to be practised in consequence of the frequency of mutilations as a punishment; the punishment for some of our sins is left to nature, and she generally relents before the whole of the organ disappears. The column is very frequently destroyed by ulceration, a consequence, as before stated, of injury or of constitutional derangement. The deformity produced by its loss is not far short of that caused by destruction of the whole nose. Happily, after the ulceration has been checked, the part can be renewed neatly, safely, and without much suffering to the patient. The operation which I have for some years practised successfully, and in many instances, is thus performed:—The inner surface of the apex is first pared. A sharp-pointed bistoury is then passed through the upper-lip, previously stretched and raised by an assistant, close to the ruins of the former columna, and about an

eighth of an inch on one side of the mesial line. The incision is continued down, in a straight direction, to the free margin of the lip; and a similar one, parallel to the former, is made on the opposite side of the mesial line, so as to insulate a flap composed of skin, mucous membrane, and interposed substance, about a quarter of an inch in breadth. The frænulum is then divided, and the prolabium of the flap removed. In order to fix the new columna firmly and with accuracy in its proper place, a sewing-needle—its head being covered with sealing-wax to facilitate its introduction—is passed from without through the apex of the nose, and obliquely through the extremity of the elevated flap: a few turns of thread suffice to approximate and retain the surfaces. It is to be observed, that the flap is not twisted round as in the operation already detailed, but simply elevated, so as to do away with the risk of failure. Twisting is here unnecessary, for the mucous lining of the lip, forming the outer surface of the columna, readily assumes the colour and appearance of integument, after exposure for some time, as is well known. The fixing of the columna being accomplished, the edges of the lip must be neatly brought together by the twisted suture. Two needles will be found sufficient, one being passed close to the edge of the lip; and they should be introduced deeply through its substance; two-thirds, at least, of its thickness must be superficial to them. Should troublesome bleeding take place from the coronary artery, a needle is to be passed so as to transfix its extremities. The whole cut surface is thus approximated; the vessels being compressed, bleeding is prevented; and firm union of the whole wound is secured. The ligature of silk or linen, which is twisted round the needles, should be pretty thick and waxed; and care must be taken that it is applied smoothly. After some turns are made round the lower needle, the ends should be secured by a double knot; a second thread is then to be used for the other needle, and also secured. With a view of compressing and coaptating the edges of the interposed part of the wound, the thread may be carried from one needle to the other, and twisted round them several times; but in doing this, care

must be taken not to pull them towards each other, else the object of their application will be frustrated, and the wound rendered puckered and unequal. Last of all, the points of the needles are to be cut off with pliers. No farther dressing is required. As previously remarked, no good end can be answered by any application, and the separation of dressing may afterwards be troublesome; discharges from the neighbouring passages are retained by it, fœtor is produced, and union interrupted. The needles may be removed on the third day; their ends are cleaned of coagulated blood, and, after being turned gently round on their axis, they are to be cautiously withdrawn, without disturbing the thread or the crust which has been formed about them by the serous and bloody discharge. This often remains attached for some days after removal of the needles, and forms a good protection and bond of union to the tender parts. Some care is afterwards required from the surgeon and patient in raising up the alæ, by filling them with lint, and thus compressing the pillar, so as to diminish the œdematous swelling which takes place to a greater or less degree in it, and to repress the granulations. It is besides necessary to push upwards the lower part of the column, so that it may come into its proper situation; and this is done by the application of a small round roll of linen, supported by a narrow bandage passed over it and secured behind the vertex.

"Independently of the great improvement produced on the patient's appearance by the restoration of the lost part of so important a feature, it may be observed, that, when the columna has been destroyed, the lip falls down, is elongated, and becomes tumid, particularly at its middle, so that borrowing a portion from it materially ameliorates the condition of the part; and the cicatrix being in the situation of the natural fossa, is scarcely observable."—(Liston's Elements of Surgery.)

Thus is the whole nose restored. Some have lately proposed to assist nature, by an artificial support of metallic construction, introduced and retained permanently within the nose. This, I fear, is but analogous to the insertion of metallic plates between

the integument and cranium, after the operation of trepanning—alike opposed to the principles of surgery, and inconsistent with the results of experience. We must rest satisfied with the productions of nature, assisting her efforts by supporting the apex and alæ, until they granulate from below, and form a sure and well-cemented foundation on the ruins of their predecessors. After this, we require merely to preserve the form of the nostrils, by the insertion of two silver tubes, till cicatrisation is completed, and contraction has ceased.

Such noses have been ridiculed, as flat and "dumpy." But, if properly constructed, though not in accordance with either the Roman or Grecian contour, as their predecessors may have been, still they are noses to do well in the world. They are literally very passable noses; for many have I known to pass those of my own making, without remarking anything particular in the features of the wearers. And surely none can deny that the worst made nose is infinitely superior to the horrid cavern which previously struck the passer-by with pity and disgust. As a fair sample of the manufacture, I annex representations of my first case, before and after operation.

It cannot be expected that the new formation is to inherit all the functions of the primary organ. The sensation of the interior is much less acute, and of a different nature; and, indeed, when handled, the sensation so occasioned may be referred to "the parent breach" in the forehead—though this is not by any means so common an occurrence as many assert. After a time, however, the interior is lined with what resembles a mucous membrane, with a mucous secretion. One of my patients I have seen enjoying a pinch of snuff, in which he largely indulged, apparently with as much gusto as the oldest and most experienced nose could possibly have imparted. But even should our constructions fail in this accomplishment, a nose is still a nose, "although there's nothing in't."

In one thing the surgeon cannot be too careful. When the organ has been lost by ulceration, he must be well satisfied that all tendency to return of the morbid action has ceased before he ventures to affix a new and healthy substance, otherwise, either adhesion will fail, or ulceration will destroy, in whole or in part, what it was his object to raise perfect and entire. Care should also be taken that the patient be not exposed to severe cold, or even to much alteration of temperature, during the first part of the cure, the flap being for some time but feeble in its powers.

Very frequently the flap becomes of a blue colour, shortly after adaptation. This may arise from two very opposite causes; either from deficient influx of blood, producing the cold lividity antecedent to gangrene, or from more blood entering the flap than can be conveniently returned by the veins. It is important to distinguish between the two conditions, for it is very apparent that what would prove eminently of service in the latter case—taking away blood either from the raw edges of the wound, or by puncture—would, in the former, but hasten destruction of the part.

Another caution to be enforced is, that the flap with which the deficiency is to be supplied, should always be somewhat larger than would seem necessary from exact measurement of the parts; for, during cicatrisation, and for sometime after, the

new formation shrinks and contracts; so that what would at first seem neat and exact, will be found shrivelled and insufficient; and what may look bulging and clumsy, will soon subside into just and seemly proportions. To this it may be, as it has been, objected, that a large wound is made in the forehead, which must produce a corresponding deformity. But, if care be taken not to induce exfoliation, if the parts be brought together neatly, so far as the form of the wound will admit—and if the remaining raw surface be treated tenderly and prudently, neither over-stimulating the part, nor encouraging exuberant and flabby granulation—all objections on that ground will be found irrelevant. Still, let it never be forgotten, that "sit modus in rebus." Let the operator beware of making his flap unnecessarily large, a practice which some surgeons have ventured to recommend, trusting that nature may in time smooth down the awkward repair into better uniformity with her own formations.

It is almost needless to state that operations of this nature are more successful when the ossa nasi are entire, than when they too have been involved in disease, and either totally destroyed, or sunk and impaired. Also, we can more confidently anticipate and promise success, when the original organ has been lost by accident—as by sudden violence—than when it has sunk beneath the ravages of disease.

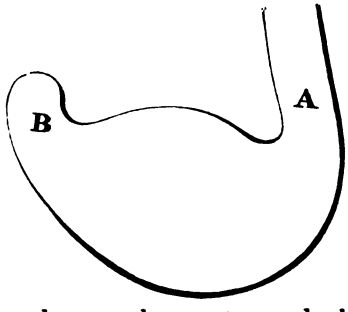
RESTORATION OF PARTS OF THE NOSE.

When the nose has been only partly destroyed, the operation for its removal is more simple and successful. The substitute part is derived either from the forehead or from the cheek, as circumstances may require.

RESTORATION OF THE ALA.—When a portion of the ala is destroyed, which generally happens from accident, the deficiency is readily supplied from the cheek. The dimensions and form of the required integument having been discovered by admeasurement with a piece of thin card; this is laid flatly on the contiguous surface of the cheek, and a corresponding portion, a little larger than the pattern, is then elevated, adapted to the deficiency,

and secured in its position by points of suture, the edges of the opening having been previously pared. When the twisted suture admits of application, it is to be preferred; for certainly, in such operations, adhesion occurs more readily with that form of suture than with the interrupted. The wound of the cheek is also brought together and retained by suture; and this can, in most cases, be done throughout its whole extent. After adhesion, the attachment of the flap is divided, as after restoration of the entire nose. During the cure great care is required in stuffing the nostril, so as to keep the new portion duly expanded, and prevent the falling inwards to which it naturally inclines, and which would certainly happen, were it left without support.

It is an advantage, in this operation, to adapt the flap without twisting the connecting neck; the coaptation is in consequence more exact, the supply of blood more free, and the vitality of the part less endangered. Thus, A, the form of flap on the cheek, B the slip of attachment. It is very plain, that by simply bringing A into a straight line with B, or a little more to its other side, the flap may be placed in apposition without any twisting of the attachment, the acute angle it previously formed having been entirely removed.



Cases.—I assisted my friend and former colleague, Mr. Walker, in an operation for the restoration of part of the ala nasi, some time since, in which this form of incision and management of the flap was pursued. I had, not long since, a most satisfactory case of the same kind, in which the deficiency was by much greater than in Mr. W.'s case, the whole of the ala and apex having been destroyed by ulceration. The deformity was very great, and this was very little remedied by a bit of a false nose which had been fitted to the void. The patient was almost obliged to give up his profession and retire from the

world. The cure was so complete, as regarded both the application of the flap, and the union of that and of the deficiency caused by its detachment, that he has again resumed his former station, and may pass muster anywhere without observation or remark.

When the ala is wholly deficient, the flap may be obtained either from the cheek or the forehead. If the cheek be full and flabby, and admit of a sufficient extent of its surface being removed without much subsequent stretching of the parts and deformity by extensive cicatrization, the flap may be taken from this quarter in the manner already mentioned. But when the cheek is naturally spare and shrunk, such procedure would be but the production of one deformity to hide another; consequently, the flap may, with more propriety, be brought from the forehead. This is done in the same way as for restoration of the whole nose; but a variation is expedient when the organ is of unusual length. Then the long and narrow connecting slip, if treated in the ordinary way, would be so indifferently nourished and so ill-supported that the vitality of the transplanted part would be endangered. To obviate this, a deep incision is made along the ridge of the nose, continuous with the wound in the forehead, at that side to which the twist is to be made. This longitudinal incision is, by a little dissection with the point of the knife, widened sufficiently to contain the connecting slip from the forehead, and into the groove so formed the slip is laid and retained until firm union of the whole flap has taken place. When this has occurred, which may not be till after a week or two, the slip is again raised by incision and cut off close to the adherent flap. The wound in the ridge of the nose is then united by suture.

Restoration of both ala and point of nose.—When both alæ, or when the entire tip of the nose has been lost, restoration is made from the forehead in the manner just described. The flap and its connecting slip should be rather longer than might seem necessary, to allow for contraction, and care should be taken that the incisions in the ridge be not so deep as to

endanger the vitality of the ossa nasi. When the nose is short the nutritive sulcus may be dispensed with, in which case the slip must be made broader than it would be in the opposite case.

RESTORATION OF THE RIDGE OF THE NOSE.—When the bones of the nose have been discharged, either from accident or from disease, the upper part of the nose falls in, and if it should happen that the rest of the organ remains uninjured, the prominence of this renders the falling in of the upper part or ridge still more marked and unseemly. It is out of our power to raise the sunk portion to a level with the point, but we can make it a raw surface, and on it engraft a sufficiency of new material from the forehead to restore the organ to its former proportions. The raw surface may be made in two ways; either by shaving off the surface of the depressed portion, or by establishing a sulcus in its centre, as if for the nourishment of a connecting slip, raising the integument a little on each side, and then inserting and permanently retaining a central portion brought from the forehead, sufficient to raise the part to its proper level. The circumstances of each particular case will determine which method is preferable. The flap is brought from the forehead, twisted, and fixed in the usual way.

Depressions of the ridge, when of slight extent, may be removed without transplantation, simply by incision. When the nose is of great length, the depressed portion may be included between two transverse incisions, inclosing a wedge-like portion. The depression is thus cut completely out, and on the edges of the wound being brought together, the ridge regains an even surface. If this be attempted with a short nose, the nostrils are turned up, and the organ reduced to a most unseemly snub snout. Another mode of incision may be adopted to prevent this: the ridge itself is not interfered with, but by plunging a bistoury horizontally through the nose, an oval portion is cut out by two elliptical incisions, one angle of the wound being towards the cheek, the other towards the ridge. By bringing the edges of this wound together by suture, the oval is brought to a straight

line, the depression of the ridge is consequently raised, whilst at the same time the nose is not shortened, nor the nostrils altered in aspect. The surgeon must, however, beware of removing more than enough in this way, otherwise an elevation may succeed the depression of the ridge.

RAISING OF DEPRESSED NOSE.

Sometimes the cartilaginous portions of the nose fall a prey to abscess and ulceration, while the integument remains intact, excepting the column, which usually shares the fate of the cartilages. The consequence is a sinking down into the nasal cavity. The depression may be obviated by simply raising the parts, after dividing any adhesions they may have formed in their new situation. By stuffing the nose carefully and neatly, the integument is retained in a proper shape, until the disposition to fall is in part overcome, and firmness and stability obtained. Then a new columna is raised and fixed; and careful stuffing of the nostrils is continued until all has become consolidated. By this simple proceeding the appearance may be very much improved.

Dr. Dieffenbach, of Berlin, recommends a more formidable treatment of this deformity, cutting the depressed portion into triangular slips, paring their edges, and arching them on each other; retaining them by suture, and transfixing them with numerous pins, as means of support during granulation. This proceeding is both complicated and severe; the after-treatment is in unison. The internal surface of the nostrils is to be "touched daily with caustic, and afterwards a luxuriant granulation is to be encouraged by means of red precipitate." In one case, "during the whole period of the treatment, the inner surface of the nose was *diligently irritated*, to promote granulation and thickening of the soft parts." Such an ordeal few patients would wish to undergo, and, in this country, few practitioners would advise it.

CHEISLOPLASTIC OPERATIONS.

The upper-lip seldom suffers in continuity, unless by congenital deformity, or by external violence, forming fissures, which are

readily united and repaired without any intervening substance borrowed from the neighbourhood. (Vide Chap. XV.) The under-lip is occasionally destroyed by external violence, in whole or in part; but more frequently falls a preyeither to the ravages of disease, to the operating knife, or caustics applied for removal of disease. The loss of the under-lip, however caused, though not so palpable a deformity as the destruction of the nose, is productive of more serious inconvenience. There is a constant trickling of saliva over the chin and neck, which not only irritates and excoriates these parts, but may materially weaken the system; articulation is indistinct; the teeth become coated with tartar; the gums recede, the teeth loosen, and the countenance is seriously deformed.

To remedy this, a flap is brought from under the chin; the dimensions necessary for supplying the loss of substance having been traced on the integument, the flap so marked is elevated by dissection, leaving a thick attachment at the symphysis menti. "The callous margins of the space formerly occupied by the original lip are pared, and the flap having been twisted round, is adapted to the edges of the wound, and retained by points of interrupted or convoluted suture. To insure adhesion, the attachment at the chin should be left thick and fleshy, and the flap should not consist of mere integument, but contain no small share of the subcutaneous cellular and allipose tissues, in order that circulation may be vigorous in the part. The integuments below the chin are naturally loose, and consequently the margins of the wound there are readily approximated. The flap soon becomes œdematous, and may require support by bandaging. After adhesion has been completed, the attachment is divided, and as much removed, in a wedge-like form, as will admit of the lower part of the flap being laid down smoothly, when it is retained in close apposition with the subjacent parts, either by suture or bandage. In the adult, union may be retarded by the edges of the flap twisting inwards, and interposing their beard between the raw surfaces; when such is the case, the offending margins must be pared away."—(Elements of Surgery.)

When the lip has been lost by operation, for the cure of cancerous or other disease, the formation of a substitute should not be attempted immediately afterwards. But the parts should be allowed to granulate, and so to repair the deficiency as far as they are able; and not until this reparative process of nature has ceased, and cicatrisation commenced, should the surgeon's knife interfere. Then the flap required will be much smaller than what would have been necessary to fill the gap when first established. Of course the cicatrised edges are made raw previously to adaptation.

When only part of the lip has been lost, the flap may be applied without the twisting of its attachment, in the same way as directed for reparation of the ala nasi.

In operating for restoration of the lip, we must not be so sanguine of success as in similar proceedings on behalf of the nose, for failure is by no means unfrequent. Aware that the circulation could not be so vigorous beneath the chin as on the forehead, I was always careful to leave the attachment at the symphysis menti as deep and as broad as possible. Yet in more than one case has the flap perished, and apparently from insufficient vascular supply. Of this, however, we need hardly be afraid when the flap is for part of the lip, and is attached without any twisting of the connecting slip. Though the parts retain their vitality, union by the first intention seldom takes place throughout the whole extent of the wound, being prevented by the trickling of saliva between the uniting surfaces. Suppuration consequently is more or less general during the cure.

OTOPLASTIC OPERATION.

It is impossible to restore the whole ear, or any large portion of it, in a satisfactory manner; but slight deficiencies admit of being well repaired by integument borrowed from behind, and applied, either with or without twisting, according to circumstances. It is an operation seldom performed, and one which a surgeon will not urge; for, in most cases, the actual de-

formity is but trifling, and, as in the lip, sphacelation of the transplanted part need not be matter of great surprise.

In all these operations on the face, there is no inconsiderable risk of erysipelas; and the surgeon must not only be on his guard against this untoward occurrence, but be prepared to treat it actively. To prevent it, as well as to promote adhesion, the wounds, as has already been stated, are brought together simply by suture, all heating and heavy dressings are avoided, and the sutures are cut out as soon as they can possibly be dispensed with. Notwithstanding these precautions, and attention to the state of the system, particularly in securing healthy action in the primæ viæ, should erysipelas occur, besides the usual constitutional treatment, blood must be taken freely from the transplanted part, and its neighbourhood, by punctures. If the attack be mild, it will yield to this treatment. But if infiltration be going on, or even threatened, recourse must be had at once to free incision, not only in the neighbourhood of the transplanted part, but in that part itself. At this the surgeon must not hesitate; for there is no risk, under the circumstances, of the vitality being lost in consequence of even very free incision; and it is now well known that wounds in the transplanted parts heal with more rapidity than in the original formations. The incisions should be made at an early period of the accession, it being of the utmost importance to cut the disease short; for erysipelas, so induced, not only interferes with the process of adhesion, and endangers either partial or total sloughing of the part, but, as experience has shown, may terminate fatally.

Such are the most common deficiencies which the surgeon is called upon to repair by borrowed integument. Accident or disease may so affect other parts of the body, as to render reparative proceedings of a similar nature both warrantable and expedient. In such cases, the operator will be guided by the particular circumstances of each, as to the most eligible method of procedure.

CHAPTER IX.

ON MORBID GROWTHS AND ENLARGEMENTS.

TUMOURS are the result of an opening out, and addition to, original tissue, a true hypertrophy, or of a secretion and deposit of abnormal structure. Some of them are troublesome, or even dangerous, from their position and size; others, again, from their intrinsic nature and dispositions. Some of these growths are traceable to injury, are slow in their increase, remain loosely attached to the neighbouring parts, from which they are cut off, and insulated, as it were, by a cyst of condensed cellular tissue. Others appear without known cause, make rapid progress, attach themselves firmly, lose themselves gradually, as it were, in the surrounding tissues, are limited by no investment, and are enveloped in a morbid atmosphere. They soon contaminate and dispose to the same morbid action all the parts around. Some tumours remain for a long period stationary, and quiet, causing little if any uneasiness; and then, from some natural or accidental cause, their circulation becomes excited, additional morbid deposit, and probably of a different nature, is made; a rapid aggravation in all respects, as regards size, feelings, and attachments, is the consequence. There can be no doubt but that tumours change their characters, become softened, assume various external and internal characters in their progress, which did not originally belong to them; that in point of fact they degenerate, and become malignant. This is more slow of occurring in some morbid structures than others. But even the fatty and fibrinous

tumours may, in the end, assume a new action, and exhibit a mixed and very questionable appearance upon a section being made of them. I have seen the brain-like matter in tumours of these comparatively benign species, of many years' growth. The more simple tumours, however, may be removed even though of large size, and at an advanced period, with a very fair prospect of a permanent cure, and with every prospect of the patient enjoying an immunity from any disease of the same kind, either in its original site, or in any of the organs of the body. Others, again, which arise, as it were, spontaneously, which increase and undergo changes rapidly, can be interfered with only at a very early period, when the constitution does not seem to be affected, when the local disease is still limited, and loosely attached, and where there is a certainty of being able to remove, not only the morbid structure itself, but some of the unaltered tissues which invest it. It would be out of place here to dilate on the pathology of tumours, or on their mode of production. The enlargements and new formations, the various solid and encysted tumours must be noticed as they arise in different regions and situations, and the mode of treatment adapted to each considered.

The region of the head and face, the cavities connected with it, together with the neck, is a prolific field of growth to such diseases, and furnishes nearly as much scope for surgical practice, as the rest of the animal machine. The cutaneous follicles become enlarged, in consequence of obstruction of their orifices, and accumulation of their contents, and often form tumours of considerable size. These occur on the scalp, sometimes in considerable numbers, and prove inconvenient by their position; they may cause deformity, and are often the source of uneasy and painful feeling of tightness in the parts around. The cysts are but slightly organized, thick and white, often formed of concentric layers, sometimes pretty tough, but generally easily lacerable. In general these adhesions to the surrounding parts are very fine and delicate, readily separated; sometimes their attachments become more condensed and firm, both to the skin and subjacent parts, as when they have been exposed to pressure and friction.

The contents are sebaceous, curdy, sometimes mixed with a fluid of a brownish colour, and exhaling a highly disagreeable odour. These tumours are not made to disappear under any general treatment, nor can they be benefited by local applications; on the contrary, their removal will, owing to the excitement and confirmation of their attachments so produced, be rendered a matter of some difficulty. No dissection is required for the removal of these encysted tumours of the scalp, unless indeed they have obtained an enormous size and from long residence and other causes, adhere firmly. In general, when the swelling is about the size of a filbert compressed, or even the bulk of a chesnut, it can be taken out, and lifted, as it were, by the forceps from its bed of fine cellular tissue upon merely dividing the superimposed scalp. The least painful and most expeditious mode, is to transfix the tumour with a narrow-bladed knife in the direction of the fibres, with the back of the instrument directed towards the cranium, and to divide thus at once the cyst and skin, by cutting outwards, a little of the hair having been previously clipped off the swelling. The edges of the incision are now slightly separated with the forefinger and thumb of the left hand, and the common dissecting forceps (an instrument seldom well made) used for seizing the edge of the cyst and extracting it. The few drops of blood that escape are wiped up, and no dressing whatever need be applied; some five or six tumours may thus be removed without much pain to the patient at one sitting. Sometimes a small clot fills the cavity, and may require being squeezed out a few days after the operation. When the tumour is very small, a slightly curved sharp-pointed knife, the edge on the concave aspect, will be found to answer best. Unless the tumour has attained an enormous size, and has adhered firmly, no portion of skin should be removed. Solid tumours of the scalp, condensed, fatty, or fibrous, are occasionally met with betwixt the layers covering the cranial bones; they often adhere firmly, and give some trouble in their removal; this will be much facilitated by free external incision in the proper direction. Portions of the scalp are also, though rarely, involved in malignant ulceration; so long as this is limited,

and the lympatics show no sign of contamination, the affected parts may be removed. This may be done freely by including the disease in circular or elliptical incisions, wide of all induration; and it may often be prudent even to uncover the bone to some extent; exfoliation of the outer lamina may or may not follow; this will soon be determinated by the colour of the exposed part. No attempt should be made when there is loss of substance to pull or retain the parts together; we must avoid all exciting causes of inflammation of the scalp, and it will always be prudent to observe well the state of the digestive organs and skin before and after such operations, and keep them in good order, correcting as far as possible any derangement of their functions. Encysted tumours about the forehead and eyebrows are seldom permitted to attain any large size, but their adhesions are generally firm, and prove troublesome; dissection is sometimes required in their removal. The difficulty will be much obviated by making the first incision sufficiently free. The cyst is thus fully exposed and may be removed unopened.

Solid and encysted tumours are frequently met with about the eyelids; the former generally grow from the conjunctival surface, the latter are situated betwixt the two layers, and often seem to be developed in the substance of the cartilage. The solid tumour may be fully exposed by everting the eyelid; it is seized with a fine hook or forceps and dissected off, along with the portion of mucous membrane from which it proceeds. Some care will be required in removing such tumours growing from the inner corner, (encanthis,) if they have attained considerable size, in order to avoid interference with any part of the apparatus for conveying away the secretions. The cysts in the eyelids generally contain a glairy fluid, they are thin and very adherent, they attain a considerable size, as regards the part in which they are situated, and occasion deformity and inconvenience; the skin is projected and often discoloured; sometimes more than one exists in the same eyelid. They occur equally in the lower and upper lid, perhaps most frequently in the latter. There is no possibility of dissecting out the cyst entire, and, in attempts

to do so, a perforation has been made through both skin and conjunctiva without the object having been accomplished. The correct and effectual procedure is, after everting the eyelid (and this can be done perfectly well after some little practice, as with the view of attacking granulations on the surface of the upper lid, by a dexterous application of the fingers, and without the aid of a probe or other instrument) and exposing the little projection within, to open this pretty freely with the point of a fine knife; a crucial incision may be made if the cyst be large, the contents escape and the bleeding is allowed to cease. The cavity is completely cleared, and the sac disturbed and lacerated by turning about a sharp-pointed probe in its cavity. If a thorough and radical cure is desired, it will be advisable to take more effectual means for the obliteration of the cavity, and for this purpose a small-pointed piece of the potassa fusa may be introduced into it for an instant. This must be done with great caution, the melted caustic being washed away with a bit of lint dipped in vinegar and water, and the bulb of the eye afterwards protected for a short time by the interposition of a small slip of lint, or old linen, smeared with oil, or some mild liniment or ointment. The safest and best mode of applying the caustic is with a very small hollow ball-probe.

Tumours of the orbit are occasionally encountered with, and, unless at a very early period, the majority of them are irremediable by the science or art of surgery. Some of these form in the cellular and fatty matter behind the bulb, which they cause to project; and so long as they are confined in the parietes of the cavity and by the fibrous web in front, they cause great uneasiness, more especially if their growth is rapid. The vision is soon impaired, or destroyed, and the organ is often involved in diseased action and structure. The majority of these tumours, whether in young or old subjects, and perhaps in the former they are most common—are soft and brain-like; their increase is rapid, and they involve and contaminate, not only the whole contents of the orbit, in a very short period, but also the important parts in the

immediate neighbourhood. The same may be said of almost all the tumours which commence in the globe of the eye. These are often seen at an early stage, when vision is not altogether lost, when the pupil is merely dilated and opacity is perceived in the bottom of the chamber of the vitreous humour, and before sensible enlargement or protrusion of the eye has occurred. The morbid structure is not slow of filling the entire cavity of the sclerotic, but it speedily disfigures the eye, projects through an ulcerated opening in the cornea, in the shape of a fungus, sometimes dark in colour, and furnishing blood profusely from its surface. The tumour is originally encephaloid and assumes the hæmatoid character, or even in its earlier stages it may be broken down and mixed with masses of bloody stuff. The optic nerve is, almost from the first, affected, and the degeneration may be traced back into the cavity of the cranium. In the earliest stages, accordingly, there is little chance of benefiting the patient by removing the contents of the orbit, even before they have begun to project from their situation. Some few of the tumours behind the bulb are of a more simple and benign character, and may be successfully extirpated without injuring in any way the organ of vision. These generally lie on the superior aspect under the orbital plate of the frontal bone, but unconnected with the lachrymal gland; their existence is suspected from the gradual protrusion of the eye-ball, the failure and gradual loss of vision. The swelling may be felt firm and resisting by pressing the finger betwixt the eye and the roof of the vault. By careful incision and dissection such tumours of considerable size have been removed, the functions and position of the eye have been restored, and the patient has enjoyed an immunity from disease. There is one specimen of large size in my collection, which was so obtained, the result being most satisfactory and the cure permanent.

The protrusion caused by acute or chronic abscess in the orbit, or accumulation of bloody serum and broken down coagula, after bruise, is not to be mistaken for that caused by tumour. The history of the case, the more diffuse swelling, the

œdema of the lids, will lead to a correct diagnosis and line of practice. A deep puncture will verify the opinion formed, and when the existence of matter is suspected the evacuation of it should not be long delayed. The disease of the eye itself is sometimes limited by its proper coats, and though not of the most harmless character, may yet be removed with a fair prospect of successful issue. The melanotic degeneration in the eye-ball is met with, although it does not so often occur as is supposed in this situation, the chronic dropsy of the eye with thinning of the sclerotic and dark projections on the surface being occasionally set down as melanosis by careless observers. Melanotic tumours have been extirpated successfully; the fluid swelling does not demand so severe a proceeding; repeated puncture, or a puncture in a favourable situation, opened at short intervals with a conical and blunt-pointed instrument, so as to permit the gradual draining away of the contents, will often be followed by complete and permanent collapse of the tunics; the part becomes quiet, and the deformity can then be covered by an artificial eye.

When it is judged prudent to remove the whole contents of the orbit, means must be taken to fix and seize the eye; for this purpose it is recommended to pass ligatures through and across the organ or to transfix it with tenacula; the forceps with hooked extremities, the vulsellum, represented p. 252, will be found the most convenient instrument for the purpose. The commissure of the eyelids at the outer angle is divided, so as to give more room, and then with a narrow sharp-pointed knife, the different attachments are separated all around, and to the bottom of the cavity. No crooked instruments are wanted to divide the nerve, and clear the orbit of all its contents, fatty matter, lachrymal gland, &c. The bleeding is readily suppressed by emptying the cavity thoroughly of blood, or clot, if it has formed, and filling it with dossils of dry lint, to above the surface of its margins, and retaining the whole by a double-headed roller pretty firmly applied: at the end of two days this may be removed; in fact, the bandage may be slackened after ten or twelve hours. The cavity is dressed lightly after the removal of the compresses with lint soaked in

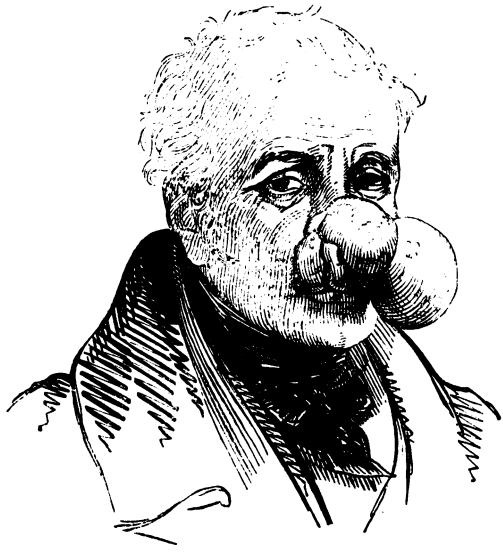
tepid water, the surface being covered with oiled silk, and after a time an astringent lotion may be cautiously added to the tepid water.

The side of the face is the seat of subcutaneous tumours, of the encysted or solid kind, of various sizes, and variously connected. It is seldom that tumours in this region are permitted to attain a large size, unless indeed they are deeply situated and firmly connected. The loose tumours of small size can readily be got rid of, by free incision over them in the right direction, by dissecting down to their cellular investment, dividing this, and then avoiding the parts with which they may be in contact, the vessels as far as possible, the branches of nerves, the cartilage of the nose, the membrane of the mouth, the lachrymal passages, or the parotid duct, according to their position; their cellular attachments are separated, and the diseased part taken away. It will be advisable not to remove any portion of integument, unless that is involved in diseased action. The incisions must be so placed and contrived, as that their edges shall come together smoothly and neatly. In many cases, in order to secure a smooth and linear cicatrix, the twisted suture must be employed.

The integument of the face is often involved in disease, commencing very generally in a warty excrescence, becoming ulcerated, and not confined in its ravages by any structure; such affections are seen in the advanced stages involving and destroying the integument, subs equently the other tissues, muscles, cartilages, bones, and the organs of the senses; various terms are applied indiscriminately to these ulcers, as,—lupus, noli me tangere, herpes exedens, can cer, &c. Many of these very formidable ulcers, though difficult to manage, are not malignant; their progress may often be arrested, and they may be made to heal over in whole or in part; with this view the everted prominent and hardened edges are to be destroyed by the application of some powerful escharotic; the chloride of antimony in its concentrated state, or the chloride of zinc made into a paste with flour, is applied and repeated on various parts, according to circumstances. These applications, the potass or nitric acid, which, however, cannot here be

so well limited in their action, are much to be preferred to the corrosive sublimate or the arsenical powders or pastes; the effects upon the system from such are often most alarming and have proved fatal; the painful feelings are allayed as much as possible by the exhibition of the preparations of opium. Constitutional and local treatment, varied according to the state of the system and aspect of the sore, must not, however, be slighted; in this way very frightful cases of what have been considered malignant and incurable swellings and ulcers have been much benefited.

The lipomatous enlargements of the integuments covering the cartilage of the apex and alæ of the nose, though sometimes presenting a very formidable appearance, are on the whole very easily managed. Their nature must be well understood, and the operation gone about on a proper plan, so as to preserve the essential parts which give form to the organ. The disease is limited to the skin and subjacent cellular tissue; the tissue is opened out somewhat thickened, the sebaceous crypts are enlarged and distended with their secretion, some of them to a considerable degree, and forming encysted tumours of the size of a garden pea; the cellular tissue is loaded with serosity, and in some places there is evidently fibrinous deposit; the arterial capillaries are not much enlarged, the veins on the surface are sometimes, as when the part is dependent or the circulation excited, or the return of blood prevented by violent exertion of the lungs, much enlarged, giving the tumour a more blue and distended appearance; different parts become affected in succession, and the mass is made up of many growths from the point and sides, of various sizes, separated by fissures in which the sebaceous secretion, often rancid and offensive, lodges. These swellings, though attached by pretty broad bases, are loose and pendulous; they do not certainly improve the personal appearance, and by interfering with the functions of the nose, obstructing the passage of air, covering the mouth when they attain a large size, and preventing the patient taking his food or drink comfortably, they prove very inconvenient and troublesome.



These tumours are very insensible, they may be squeezed and pulled about without causing pain, nor is their progress marked by any suffering; their growth is very slow and gradual. The patient from whom the above sketch was taken, had perceived the

rudiments of the enlargement fifteen years before he applied for relief. The operation, at his request, was performed at twice, with eight days interval, and in five or six weeks he presented this improved appearance.

A dread of troublesome and dangerous hæmorrhage seems to have restrained surgeons generally from interfering with these cases, and freeing patients from this shocking deformity and serious annoyance, although many would be willing enough to submit to anything, in order to be relieved. Mr. Hey, of Leeds, and Mr. Barlow, of Blackburn, have each published a successful case, and two very good ones are related by M. Civadier, in the 3rd vol. of the "Mémoire de l'Académie de Chirurgie," as operated upon by him and M. Theulot so early as the years 1732 and 1753. The disease is there described as carcinomatous. It has been stated to me on the best authority, that my late worthy friend, Sir W. Blizard, under whom I had the honour of studying at the old London Hospital, operated on one occasion upon the hypertrophied nose of a man, whom he had admitted for the cure of an ulcerated leg. He thought that whilst the man was necessarily under treatment for this malady, he might as well be relieved of his deformity. Incontrollable bleeding occurred, and continued to such an extent as to free the patient from all his earthly troubles and sorrows within twenty-four hours. Such a case as this occurring in the hands of a man high in the profession, and a misapprehension of the true nature of the disease, may have naturally enough rendered surgeons rather shy of recommending or undertaking, even at the request of patients, any operation for their relief, or the improvement of their appearance, "an operation out of complaisance," as it has been termed.

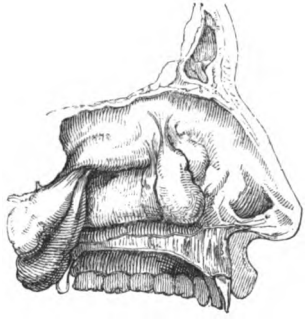
Portions of the morbid mass have been removed by ligature, but with no very satisfactory result. The cartilages of the alæ had evidently suffered, in one case in which this was attempted; in fact, it is impossible by this means to remove with precision the diseased part only, and to leave the true form of the organ. Besides, the fætor attendant upon the separation of the mortified part in this situation, must be sufficiently disgusting and intolerable to the patient.

The morbid growth can be dissected off, without the least risk of hæmorrhage, and by the observance of due care, and a little neatness, the form of the organ can be most perfectly preserved. An incision should be made through the diseased integument and cellular tissue in the mesial line, upon the cartilage of the apex, and columna, not however so as quite to reach them; an assistant places his fore-finger in one nostril, and the surgeon, seizing the mass in his fingers, or with a small valsellum, proceeds to dissect it off with a scalpel; the incisions must be carried pretty close to the cartilages of the ala, until the one side is cleared, the edge of the opening being well observed, and neither that nor the cavity encroached upon. The assistant will give warning if the knife, at any stage of the proceeding, approaches his finger. The surface is trimmed a little, if occasion requires, with a pair of thin, slightly curved or knife edged scissors. A similar proceeding is observed on the opposite side, and they are to be made as symmetrical as possible. A few vessels may bleed, but the bleeding is easily restrained during the dissection, by placing the small spring forceps (Graefe's) upon their mouths, or they are compressed by the point of the finger; ligatures are afterwards placed upon them if they still persist in bleeding. Should the ligatures not hold, the cut ends not being readily drawn out from the condensed tissue, a fine cambric needle may be passed across the bleeding point, and a ligature tied under it, the ends of both the needle and thread being cut off. Any troublesome general oozing may be stopped by plugging the anterior nares, applying a compress of lint, and a double-headed roller. Difficulty and pain is experienced in removing this dressing, and it is much better, if possible, to apply frequently and assiduously for a few hours, pledgets of lint moistened with cold water, and after coloured discharge has ceased, to substitute the tepid dressing, and thus encourage suppuration as speedily as possible. The exposed surface in this situation soon becomes clean, and presents small, pointed, and florid granulations; then the zinc or other lotions, well diluted, are employed with advantage. Cicatrization very soon takes place, and

the surface at first glazed and discoloured, soon assumes a perfectly natural appearance. I have thus removed the diseased parts in a great many cases, without one untoward accident. In one case only, I have had occasion to repeat the operation, and that at an interval of nine or ten years. A tumour of large size was in the first instance removed from the apex: at that period there was but slight thickening of the integuments of the alæ, which it was not thought necessary to interfere with. This increased so as to form a large swelling on each side of the apex, which, however, remained smooth and very sound. The lateral growths were taken away, much to the satisfaction of the patient, who was now no longer subject to the annoyance of being stared at in the street, or run after by little children as "they went to fetch mustard."

The tumours which occupy the interior of the nostrils are also most happily of a simple and benign nature in the majority of cases. They seldom occur singly, and are met with occupying very frequently, to a greater or less extent, both nostrils; they hang by pedicles in clusters from the membrane lining the superior turbinated bones, present a smooth surface, and are by no means very sensible; they are semi-transparent, and gelatinous-looking when removed, with small vessels carrying red blood, ramifying through them. These mucous polypi sometimes exist for years without attaining any great size, or attracting particularly the attention of the patient; they do not seem to degenerate. I have met with cases in which they had existed for ten, fifteen, or twenty years, causing latterly much annoyance, and they have been at a few sittings eradicated successfully and permanently. A professional friend sent to me lately in great alarm, about a troublesome hæmorrhage from the nostril. In blowing his nose forcibly some hours previously, he had ejected a tumour of large size from the situation which it had occupied, and the existence of which he had not been sensible of. Its bulk was fully as great as the first joint of the thumb, and it must have existed for a long period. On careful examination afterwards with the speculum, others of a smaller size could be seen in each nostril. In general

these tumours cause inconvenience, by occupying the fissure betwixt the anterior and posterior cavities of the nostril. They obstruct the free passage of air, and give the patient the feeling of constantly labouring under a cold in the head. The mucous secretion is much more abundant than natural; the sense of smell is destroyed, and the taste becomes less perfect and discriminating. The hearing, even, is obstructed in the advanced stages of this disease; the nostrils are expanded, and the bones become separated, so as to alter the appearance of the countenance; the eyes appear watery and distended, and when the atmosphere is charged with moisture, the growths sometimes project externally, filling up the meatus and resting on the lip. These tumours, instead of containing a serosity in cells, occasionally consist of a serous cyst, more or less thick, covered externally by adventitious mucous tissue. The soft mucous polypus seldom occupies the posterior cavity of the nostril to any great extent; it may hang into it, as it does into the anterior space, but it is not common to find it appearing in the throat behind the velum. Such cases do present occasionally, and the annexed plan will give a very correct idea of the state of matters, in a young lady in whom I operated successfully a few weeks ago.



After clearing the anterior cavity and fissure completely, by the removal of the tumours hanging in that situation, the passage of air was still as much obstructed as ever. The throat, the velum having been observed to bulge forwards, was again examined, and by lifting the margin of the fold, the body of a tumour could be brought into view. The patient stated that she had in damp weather, on inspiring, been able occasionally to see it. The nature of the tumour was apparent enough, and it was pretty certain that its attachment was by a narrow base. The forceps were carried deep into the cavity of the nostril, the neck of the polypus laid hold of and twisted off; the tumour, which then

dropped considerably, was laid hold of by a small vulsellum in the throat, and so extracted. Neither the turgescence of the Schneiderian membrane upon the inferior spongy bone, nor the projection of the cartilaginous septum into the left nostril, which is very common, and may be attended with chronic congestion, and swelling of the membrane lining the whole cavity, accompanied by continued discharge and stuffing of the passage, must be mistaken for the disease which we have had under consideration. Such errors are occasionally committed and acted on to the prejudice of the patient. The mucous polypus can only be removed, thoroughly and effectually, by the determined yet judicious and gentle employment of forceps suited to the size of the cavity. Those made for sale by cutlers are more like farriers' tools than surgeons' instruments. The instrument must be slender yet strong, well fitted at the extremities; a pair of spring artery forceps, or small vulsellum, will sometimes be found useful in fixing and pulling forward the larger growths, so that they may be seized at their neck. One is laid hold of after another, and, by a turn of the hand, detached and extracted. No violence is advisable, no crushing and extracting bits of the turbinated bones. The delicate nature of their structure, and the vicinity of the base of the brain, must be kept in view, to say nothing of the cruelty and uselessness of removing healthy structure in such cases. Some not very adroit people seem to find it an easier matter to bring away the spongy bones and their coverings, than the polypous growths. It is impossible to promise a cure from one operation, and of this the patient must be previously made sensible. There is always some slight flow of blood attendant upon the twisting out of polypi, (for they are not to be pulled out,) and after a few are removed the view of the surgeon is obscured. In cases of old standing, where the cavities and fissures are much dilated, the introduction of the little finger, which can then readily be passed to its full extent backwards, will convey information as to the existence and site of those which remain, and will serve to guide the forceps safely. The nostril should be cleared at the first sitting, so that the

patient can breathe pretty freely through it; after the parts have recovered and the tenderness has abated, that is to say, at the end of six or eight days, the cavity is again examined. The nostril will probably be found again closed, and tumours will present in it as if nothing had been done to eradicate them. The polypi, confined in the narrow spaces and anfractuosities, expand and fall forward, occupying the site of those which have been extracted. In examining the nostrils in recent and doubtful cases, and at the latter sittings, in order to be certain that nothing remains, great assistance will be derived from the speculum, which I have used for some years, and which is now to be had of the principal instrument makers. The patient should, in the explorations and operations, be placed in a good light, the head thrown back and supported by an assistant, and the blood is best prevented from running down the neck and soaking the clothes, in this and other operations on the face, and the cavities opening upon it, by the old-fashioned basin of the barber-surgeons. Should bleeding persist after these operations, it can in general be readily stayed by pushing, with the forceps or director, a long piece of lint into the posterior cavity of the nostril, and stuffing that and the anterior cavity as well as possible. It is right, in all cases, to place a bit of lint lightly in the cavity and retain it a few hours, or at least until the patient has got comfortably seated at home.

If the bleeding be not arrested by the methodical introduction of lint from the anterior opening of the nasal fossa, it may be necessary to close the posterior cavity effectually. This is easily effected by the introduction of a ligature from the mouth forwards into the nostril; a loop of silver or other wire will answer, as well as any of the complicated instruments sold for the purpose of conveying the ligature. This is passed along the floor of the nostril from before backwards, it is seen and laid hold of by the fingers, or blunt hook, or forceps, in the pharynx, and brought forward; to this is attached a strong thread ligature, which is drawn into the passage by the removal of the wire. To the middle of the ligature, a piece of lint, the

bulk of the first joint of the thumb, larger or smaller, according to the size and sex of the patient, is attached in a noose. This is conducted by the finger behind the velum, and pulled firmly into the cavity. The anterior opening is then plugged with lint also. The dossil is easily removed in a day or two, after washing out the coagula, by pulling at the string and assisting in its dislodgement, by the introduction from before, of a strong blunt probe. It is seldom necessary to adopt this proceeding after operations for polypus; but it may be, and is occasionally required, for the arrestment of spontaneous epistaxis, after all other means, local and general, have failed.

A tumour of a different character is found to occupy, in some rare instances, exclusively the posterior cavity of the nostril. It is of firmer consistence than that above noticed, fibrous, or lamellated in texture, covered by mucous membrane, and attached more firmly and by a broader base. As this growth increases in size, it causes, from its situation, uneasy feelings, and ultimately interferes with the articulation and deglutition. Its removal can only be effected safely by ligature. A loop of wire or catgut can be passed into the fauces as already directed, and this, expanded on the middle and fore-fingers, can, by an effort, be passed over the body of the tumour, and drawn up to its neck. The confined situation, the struggling of the patient for breath, and his efforts to vomit, offer difficulties, but these can be overcome by determined and dexterous management.

The wire or catgut ligatures cannot be depended upon; they are apt to give way after a day or two, if much resistance is offered to their being tightened, as when the neck of the tumour is thick or very dense. A ligature of fine strong cord can easily be carried round the base of the tumour, either with the finger, or by means of the loop of wire. The ligature is tightened from time to time, and drawn through a piece of metal tube in the nostril, as a bit of silver catheter, and fixed to the eyes, or it is tightened and secured by an iron stalk, with rings at each end. Tumours of a malignant character, proceeding from one or other of the sinuses, which open into the nasal fossæ, are sometimes found occupying these passages completely. They are of the

nature of medullary fungus; sometimes they present the character of fungus hæmatodes. Such growths, when they present in the nostrils, are perfectly irremediable and uncontrollable by any surgical proceeding. If such tumours are ever interfered with, or removed in part, in order to give relief to the patient, to do away with the obstacle to his breathing, or swallowing, there is a risk of considerable loss of blood, and a certainty of a very rapid reproduction.

The lips are occasionally the seat of small encysted tumours; they lie under the prolabium, and contain a thin, glairy, straw-coloured fluid; the bag is thin, and firmly adherent. A free opening, and, after the discharge has ceased, the turn of a pointed bit of the lapis infernalis in the cavity, will ensure a permanent cure. Solid tumours form in this situation, and are generally at some period attended with ulceration; this may, however, be a cause of induration and tumour, as well as a consequence. Malignant ulcerations are always attended with a degree of swelling and hardness about their base; these may first appear on the surface, in the form of abrasion from external causes, or may follow a warty excrescence. In some cases, the enlargement of the part is considerable before the surface becomes broken. Many ulcers of the lips may, by the removal of the exciting cause, proper dressings and repose of the part, be encouraged to heal rapidly and permanently. Some obstinate sores may with propriety be treated with escharotics. The paste composed of equal parts of the chloride of zinc and flour, about which so much has been lately written and said, will be found to answer well; it does not spread, and is very manageable; as to its power of concentrating the virus, or destroying the disposition to malignant disease in the surrounding parts any more than other caustics, that is all idle talk and conjecture. Operations upon the lower lip and angle of the mouth, are frequently required for the removal of malignant disease in the form of warty excrescence, or ulcer with induration, commencing in and involving the prolabium, mucous membrane of the lip, mucous follicles, or surrounding cellular tissue. The character of the broken surface,

and of the indurated base, cannot be mistaken. If advantage is to accrue from the extirpation, it must be undertaken at an early stage, before the lymphatics have become contaminated, certainly before they have shown any irritability or swelling, and it must be thoroughly effected, the incisions being made very wide of the morbid structure. This must be the first object, and it can be accomplished in many cases, so as to leave little trace or deformity. Previous to the operation, the mouth must be put into a comfortable state; any bad teeth or tartar must be removed, more especially from the centre of the lower jaw, and the state of the gums must be looked to; the patient afterwards must abstain from the application or use of any exciting cause, as smoking a short pipe or cigar. When the disease is limited to a small portion of the prolabium, and the cheeks are loose and extensible, as in old persons who have lost many of their molares, it may be included in a V incision, the two limbs being of equal extent, so that they may come smoothly together. This is done with least pain to the patient, by transfixing the lip at the apex of the part to be removed, the lip being stretched by the fingers of the surgeon and an assistant. The knife is directed so as to divide the parts through the free margin of the lip, towards the surgeon. He then seizes the part to be removed, and makes the second limb of the incision, either by laying the blade of the knife upon the prolabium and cutting towards the apex, or by again transfixing close to the original entrance of the bistoury and cutting upwards; the slight remaining attachment is immediately separated. The incisions are thus made much more smoothly and quickly than by the use of the scissors or scalpel, with the aid of any sort of forceps, crooked or straight. The edges are put together by the twisted suture, as will be explained and delineated in the XVth Chapter. But the greater part of the free surface of the lip may be implicated,

and any attempt to bring the divided edges into contact would be almost certain to fail, and if successful, would be attended with great deformity and inconvenience from the almost total closure of the mouth. The diseased part must be removed wide of the hardness. This is easily effected, the parts being put upon the stretch, and the bistoury passed through the lip; it is first directed to one angle of the mouth, and then to the other; a point of suture may be passed, after any bleeding vessels are secured, through the skin and prolabium, and the water-dressing applied. At first, the saliva is not well retained, but it is satisfactory to see how much the lip is elongated after a time; and when the cicatrisation is completed, but very slight deformity remains. The fact is, a good deal of the base of the sore is adventitious, and displaces so far the healthy structure. When more than one half of the free surface of the lip must of necessity be taken away, it is better practice to follow this latter mode of proceeding.

The loose cellular tissue under the tongue contains, pretty often, fluid collections, and is occasionally also the seat of solid tumours. Some of the former are connected with the salivary ducts, arise from obstruction of their orifices and consequent dilatation. In slight cases the orifice may be easily cleared and enlarged by the introduction of a small blunt probe; the obstruction may arise from the accumulation of earthy matter, which indeed is often deposited so as to form a considerable concretion, a salivary calculus, as it is called. There is no difficulty in detecting or removing this foreign body. Encysted tumours, unconnected with the salivary ducts, are frequent, and often attain an inconvenient size, so as to interfere with the free motions of the tongue, and render the speech indistinct. Their cysts are generally thin and very adherent; they are, besides, extensive, passing amongst the muscles, deep under the tongue. The contents are generally thin and glairy; sometimes the cyst is thick, coated with hairs, and the contents athenomatous. It is vain to think of dissecting them out, either entire or piece-meal. The introduction of a seton, as proposed,

is attended with risk from inflammatory infiltration into the loose tissue around. I have been long in the habit of opening the cysts freely, and destroying them by the free application of potass; no dressing is required, but the patient may use, for a few days, some detergent lotion. The result is most satisfactory, for out of a great many cases, I have known of no return of the disease. Fluid collections in this part, more especially if connected with the salivary ducts and glands, often attain, when neglected, a large size, and cause tumour under the chin. An unhealthy abscess may result, demanding a free and dependent incision from without; the discharge is at first thin and flaky, of vitiated saliva and mucus; it becomes purulent, and the swelling gradually abates.

Solid tumours, generally fatty, are sometimes found in this situation, causing the same indistinctness of articulation as the ranulæ—so the fluid tumours are termed—and presenting to an inexperienced observer the same characters, the bulging of the membrane into the mouth, the displacement of the tongue, and the swelling under the chin, when the tumour has attained a large size. The solid growths are benign, loosely connected, and demand interference on account of their inconvenient size and position. I have removed some of large size from this region, by dividing freely the membrane of the mouth and detaching the tumour with the fingers from its fine cellular bed. It requires some little tact to distinguish betwixt the fluid and solid tumours in this situation, and even in other and more exposed regions, when there is no difficulty presented to free handling of swellings, those composed of solid matter are not unfrequently supposed to contain fluid of some sort or other, and *vice versâ*. This often enough occurs from overlooking the history and from confounding the feeling of softness and elasticity with that of fluctuation.

The tongue itself is affected by swellings of various kinds. It is subject to simple engorgement and enlargement, with more or less hardness, and this may result from inflammatory action induced by injury, by long-contained irritation, or it may arise

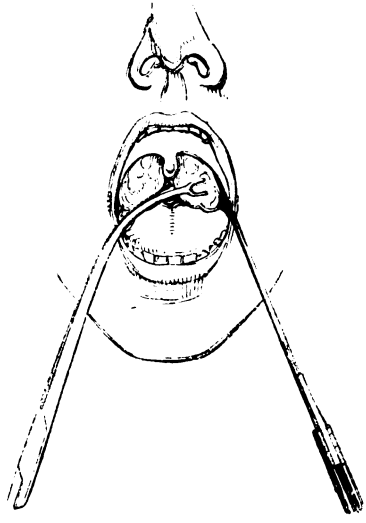
from derangement of the general health. Adventitious growths of fibrous or other structure sometimes proceed from the organ and parts of it, and become occasionally affected by malignant induration and ulceration; the organ has been found affected also, though rarely by erectile tumour. Many of the more simple enlargements may be got rid of by the removal and abstinence from exciting causes, by a due attention to, and correction of, the general health, and by local abstraction of blood. It is absolutely necessary, in some cases, to remove, by operation, the diseased and altered parts. When these are favourably situated, and not extensive, the vulsellum and knife may be employed, there being no great difficulty in holding the organ so as to secure any vessel, or take other means of arresting the flow of blood. If a large portion of the tongue is involved, recourse must be had to ligatures; these are passed wide of the disease, by means of needles fixed in handles, the perforations for the thread being close to their point. Two or more double ligatures are introduced, and, by these, others and stronger ones are drawn through and tied so as to strangulate the whole base; they should, with the view of saving pain and abridging the process as much as possible, be drawn with extreme tightness. The salivation is most profuse and the discharges and effluvia very offensive; some lotion to correct this as much as possible may be prescribed, and after the separation of the dead part, the healing of the breach of surface is promoted by all possible means. Tumours situated on the posterior part of the tongue, projecting from it, may be thus removed, care being taken, in introducing the needles, to guard with the finger the epiglottis, or other important parts. After one ligature is introduced, the organ is completely under command.

The swellings about the velum palati prove a source of great uneasiness to patients; they interfere with the passage of food, and they interrupt,in some degree, also, the free passage of air; they alter the voice, cause noisy respiration, more especially when the patient is asleep, and may even threaten suffocation. Sudden death from enlarged tonsils has been known to happen,

viscid mucus being entangled in the narrow fissure betwixt the swollen glands. The acute swellings are to be got rid of by antiphlogistic means, and by incision, if it is evident that fluid has been secreted betwixt the folds or in the substance of the mucous glands. The incision must be directed backwards, the head being well secured by an assistant; the danger of carrying the point of the instrument deeply to either side in the throat is well known, and there might be great risk from any sudden motion of the patient. A knife, covered by a canula, into which it is retracted by a spring, (pharyngotome,) may be used for the purpose, and is useful in operating on young subjects, in opening abscess in the mouth, throat, or pharynx; but in the majority of cases the long, narrow, sharp-pointed bistoury may be used with safety and advantage; it may be so far rolled in a slip of lint; it is passed along the fore-finger, which secures the tongue, the back of the instrument being towards that organ, and its point directed to the soft and prominent part of the swelling; it is entered into it and an incision of sufficient extent made upwards.

It was customary to remove the chronic enlargements of the tonsils and uvula by ligature, and, strange to say, this method is still preferred and practised by some surgeons. It is a most difficult, tedious, painful, and unsatisfactory proceeding, so far as I have seen and can understand; there is no excuse for persisting in it, no risk whatever of bleeding is incurred, if the incision is practised properly. In many cases, by getting rid of the cause, or waiting until that disappears, until wisdom teeth make their way through the gum, (this may sometimes be accelerated) by the use of strong astringent applications and constitutional treatment, the necessity for any operation may be dispensed with. But in cases where other means have failed, where much inconvenience is felt,—above all, when the isthmus faucium is much narrowed, and any alarming difficulty of respiration has occurred, then the removal should not be delayed. It is by no means necessary to remove the whole tonsil, and the attempt would be attended with the greatest danger. The

enlargement is but an opening out or simple hypertrophy of the gland; the surface heals kindly, and there is no reproduction of the tumour; were the growth an adventitious one the practice could not be defended, and it would not answer the purpose permanently. The prominent part of the swelling may safely be removed from one or both sides. The patient is placed opposite a strong light, the surgeon depresses the tongue with the fore-finger of one hand, and seizes the body of the gland with the vulsellum held in the other, as here represented. He then



introduces the narrow, straight, blunt-pointed knife, which he has held in readiness betwixt his lips, with its edge directed upwards under the gland, and by a few gentle sawing motions, severs it on a level with the folds of the velum. The instruments, knife, or vulsellum, must be held in the right or left hand, according to the side operated upon. Immediate relief follows this proceeding; it is not by any means so painful as the removal of a tooth, and is not attended with greater loss of blood.

The uvula, when affected by chronic enlargement which has resisted judicious treatment, when altered in structure as is some-

times the case, hard and warty at its apex, may be safely and with propriety abridged. Constant irritation about the glottis, and troublesome cough and expectoration, are thus often got rid of at once. A pair of long and good scissors answer the purpose best; the extremity of the body is laid hold of and put upon the stretch by a pair of long forceps with sharp points, adapted to the operations on these parts; at one snip it is cut across in its middle. Adventitious tissues now and then are developed in this situation, they are lodged betwixt the layers of the soft palate, or adhere to its surface by a base more or less broad; the former may have attained a large size, and contracted firm adhesions, and this may have been accelerated and increased by improper treatment, by partial incisions, and impotent attempts with caustics. The connexions may be such, that the extirpation cannot be attempted without great risk from hæmorrhage, and without the destruction of parts, the functions of which are important. Tumours of fibrous or fatty matter may sometimes be taken away by simple division of the anterior layer of the velum, and with but little use of the knife, after their surface is freely exposed, and with trifling loss of blood. Those on the surface can also be thoroughly removed without danger of their recurring, and without any derangement of the parts, in function or structure, to which they have been attached. Even large and formidable tumours may sometimes be thoroughly eradicated from this region; and I was concerned in a case of the kind some time ago, with my friend, Mr. Grainger, of the Borough, in which, though with some difficulty, he in the end succeeded in removing a large diseased mass from the one side of the velum and pharynx. The patient recovered perfectly his distinctness of articulation, and obtained a most satisfactory cure of a large, and very awkwardly situated, disease. The operation was undertaken under an impression, which turned out to be well founded, that the tumour was not of a malignant nature, that it was bounded by a cellular cyst, and not intimately attached to its coverings nor the important parts around.

None of the operations in the mouth or fauces can be accom-

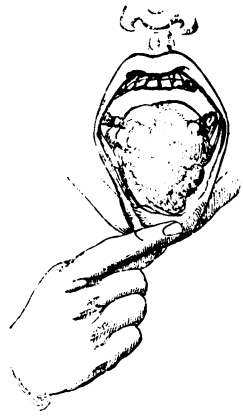
plished without the full consent of the patient throughout the entire proceeding. The surgeon must be confident before he undertakes and sets about any operation likely to be at all tedious, or attended with difficulty, that the patient's mind is fully made up to bear it well, and to afford every possible facility. The jaws may be prevented from closing involuntarily by placing betwixt them a cork or the wooden handle of any instrument; innumerable specula have been contrived for separating the jaws and holding down the tongue, but they are wholly inapplicable in practice; even were it justifiable, it would be found next to impossible, to force and keep open the mouth even of a child against its inclination, so as to conduct any delicate or troublesome operation to a satisfactory conclusion. Some rare cases of pendulous and polypous tumours of the pharynx have been met with and narrated; they have been brought into view by producing inverted action of the stomach and gullet, and some of them have been removed by surgical operation. I have not met with any such cases, and cannot from experience give any directions as to the most proper line of proceeding; that, in fact, must depend entirely upon the circumstances; I can conceive no difficulty likely to arise in carrying a ligature round its base, if the tumour can be brought into view, or placed within reach of the surgeon's fingers.

The morbid growths which involve the superior and inferior maxillary bones are, as might be expected, of various kinds, and their structure and disposition apparently depends somewhat upon the tissue from which they have originally sprung, as the gum, membranes of the teeth, periosteum of the alveoli, the surface or internal structure of the bone, or the membranous lining of their cavities. The most frightful tumours affecting these parts, which I have witnessed, have commenced in some of the neighbouring tissues. I have repeatedly seen malignant tumour of the lower jaw, to the bulk of which it had so far contributed, and which had, on reviewing its history and progress, without doubt, commenced in the soft parts; the upper jaw, it is well known, is involved at an early period in the malignant degeneration of the

contents of the orbit, or of the mucous linings of the ethmoid and other cells. Very many of the tumours of the jaws are traceable to faulty growth or position of the teeth, to disease of their bodies, or to improperly-conducted operations upon them. The tumour of the gum, epulis, is often a simple growth of the consistence of the structure from which it proceeds, and not likely to be re-produced if the exciting cause is removed, and the entire disease extirpated; the cause is decay of some part of one or more teeth, of the crown, neck, or fang, or it may arise from their being crowded and displaced. The lower jaw is the most common situation of epulis; it appears in the front of the mouth, occasionally at the root of the molares, and the upper jaw is by no means exempt from it. Some of the large tumours in my collection, removed along with this bone, appear originally to have commenced in the alveolar ridge. The size and extent of epulis is various; it may be confined to the gum betwixt two teeth, or it may have been neglected long, have taken in several, and may be attended with alteration in structure of the alveolar processes and their covering. The disease is generally connected with affections of the permanent teeth, but it is met with as a disease of infancy; and about two years ago I had occasion to remove a very large tumour of this nature, along with several decayed temporary teeth and their alveolar processes, from the lower jaw of a boy of ten years, in the North London Hospital; it was doubtful, from the extent of the disease, whether or not it might be necessary to remove the whole thickness of the bone to some extent; the cheek was divided so as to expose and examine it thoroughly and satisfactorily, but in such a way as to leave no deformity; the tumour was insulated, and removed by a small saw and cutting-forceps, leaving the crown and pulps of the permanent molares exposed; the parts healed over them; there is now no appearance whatever of disease, and very little of any operation having been performed; and the permanent grinders are coming forward, and appearing quite naturally.

The tumour of the gum is of slow growth; it remains generally of the same firm consistence, and its attachments are broad and

firm; its surface even when large is covered by membrane, is unbroken, it becomes lobulated unless it projects from the mouth, and



is exposed to injury; the teeth are loosened and present in various parts of the tumour; around their base, some excitement may be kept up, and even some ulceration and discharge. The tumour is not of a malignant nature in general, and even in its advanced stages is not inclined to contaminate the parts in its neighbourhood; if thoroughly removed it does not return. A soft tumour of the gum, rapid in its progress, broken on its surface, and furnishing fetid and bloody discharge, is sometimes, it is said, met with; there is no danger of mistaking the one kind for the other, the remediable for the malignant; fortunately the latter is rare. I cannot recal to my recollection any case that I have seen of decidedly malignant disease springing from the gum.

The operation for the removal of epulis is modified according to its size and situation; one or more teeth must always be sacrificed in order that the operation may be effectual. In general swelling and thickening of the alveolar ridge and its coverings, the mere removal of those bodies that are offending, will often be followed by a subsidence of all alarming and uneasy appearances and feelings. In order to extirpate effectually any morbid growth proceeding from the investments and roots of the teeth, these must first be extracted; the growth is then surrounded by an incision with a strong pointed knife, and if need be, part of the alveolar process is also taken away with cross-cutting forceps; if the tumour is of considerable size, and the alveolar process deeply implicated, it will be prudent, after removing teeth on each side of the disease, to cut down the bone with a fine saw, after having made the incisions, but before applying the forceps. In operating on large tumours connected with the molares, and in order to gain free access to them, it will sometimes be prudent

to divide the cheek to some extent, the pain and duration of the proceeding will thus be much diminished, a better chance will be afforded of making the proceeding effectual, and if matters are well managed, as regards the direction of the incision and the after dressing, there will be little or no consequent deformity.

Tumours commencing in the gum, sockets, or surface of the bone, are sometimes neglected so long, allowed to gain such a size, and take such a hold of the upper or lower maxilla, that the whole disease cannot be eradicated without at the same time taking away these bones in whole or in part. The superior maxilla, as already said, is the seat of epulis of unlimited growth, but still of a simple and benign nature. I am almost inclined to believe that the case here sketched was originally of this nature.

It had been removed when recent, but only in part, and grew again till after many years it presented the above very formidable appearance. It was removed successfully, as detailed in the "Lancet," vol. i., 1836—37, p. 237, and alluded to and figured in the "Medico-Chirurgical Transactions," vol. xx. p. 198. The superior maxilla of one side, and part of that of the other, were necessarily removed, yet the disease seems to spring entirely

from the alveolar ridge; it overlapped the palatine arch and other parts of the bone, but these are unaffected, and the antrum, though narrowed a little, is quite free of disease, its lining membrane being entire and healthy.

But the body of the superior maxilla is subject to diseases of a different nature, many of them, it is true, originating in disease of the teeth; but they occur also from external injury, and some appear without assignable cause. The enlargements arise from fluid collections, or from solid growths, of various kinds. Swelling of the upper jaw and cheek, of considerable size, follows acute inflammatory action of the lining membrane of the antrum; the parietes are expanded and thinned, with great pain and deformity. Œdema of the soft parts of the cheek adds to the prominence: after a time the secretion may find a partial vent by the side of one of the teeth, or into the nose, though this is rare. The discharge then takes place through an ulcerated opening, the natural one being small, but unfavourably placed and closed by turgescence of the Schneiderian membrane. The inflammation may have been caused by external violence, but it is more generally traceable to irritation in the corresponding alveolar ridge. The removal of the offending teeth or stumps, and the formation of a very free and dependent opening, is followed by subsidence of the swelling, and in the end by cure. A very good opening cannot well be made when the alveolar processes are entire. If the teeth are decayed and absorption of their sockets has proceeded well, or if, as is the case sometimes, portions of the alveoli are necrosed, then after the extraction of what is proper, a sufficient opening can easily be made by a triangular perforator. If, again, the teeth are quite sound, not crowded, their gums and sockets perfect, we are scarcely warranted in recommending the removal of any of them, and if we did, but a very insufficient perforation could be so effected. In such cases it is better, by dividing the membrane of the mouth above the canine or first small molar, to perforate the cavity through its thin anterior wall; a small instrument is first employed, and the opening is enlarged by larger ones, so that the point of the little finger can nearly be

admitted; no repetition of the operation, and no trifling with injections or tents will then be required. It is to be kept in view, that alveolar abscess may attain a considerable size in the neighbourhood of the antrum maxillare, without communicating with it; such cases when neglected may, and often do, ultimately lead to collection in the natural cavity. In alveolar abscess the extraction of the faulty tooth will be followed by immediate relief and subsidence of the swelling, and in recent cases it is well known that the cyst of the abscess, sometimes of considerable size, comes away attached to the point of the fang. The accumulation of glairy fluid or of serosity, with some purulent and flaky matter, which in the cavity subsides and occupies the most dependent part, (as is the case in the collections in various situations,) takes place very gradually in the cavity of the antrum: cases are rare, but they sometimes present, at the end of several years from the period at which the cheek has begun to feel uneasy and to change its form. A new and adventitious secreting membrane lines the interior of the cavity, and the tumour may partake of the nature of chronic abscess, (lymphatic as Kirkland has named it,) or of a serous encysted tumour; the parietes of the cavity are much expanded and thinned; at parts the bone almost disappears as it does under the pressure of the solid growths, its place being supplied by a thin but dense membrane; it yields under firm pressure, and resiliates with a crackling noise like parchment. The removal of decayed portions of teeth, if any exist, and a very free opening somewhere in the bottom of the cavity, must be resorted to; a bistoury will often be sufficient for the purpose, a portion of the attenuated bone and membrane being thus easily removable. I have found, after a time, well-applied pressure to the cheek, with compress and double-headed roller, useful in several cases, in restoring speedily the side of the face to its normal form and size.

But, unfortunately, the maxillary antrum is more frequently the seat of a soft, brain-like and malignant mass, than of this chronic collection of fluid. No age or sex is exempt from it; and when it has fairly declared itself and has begun to appear

through the parietes at any point, it is irremediable by any known means. This disease seems sometimes to be connected with the soft tumour which grows from the apex of a tooth and from the investing membrane, the periosteum of the fang. Generally, however, it originates in the degeneration of the mucous membrane lining the cavity, which it rapidly fills. In the first stage, which may exist for some months, the cheek is prominent and bulging; it has the same smooth appearance as is presented by the chronic fluid-swelling, and the integument is, for a time, as loose and free from infiltration. The parietes are hard and unyielding, but a softened part may perhaps be detected in the palate, cheek, or towards the tuberous process; this yields to the finger, and affords a pulpy feel; the same elasticity as described in speaking of fluid tumour is not perceived. Some considerable time may elapse before the tumour bursts through the parietes, and, before it does so, it has generally pushed its attachments backwards, has filled the cell of the palate bone, has involved or contaminated the lining membrane of the ethmoid cells, and perhaps even that lining the sphenoidal sinuses. The patient has all this time suffered a dull uneasy feeling in the cheek, a sensation of fulness and distension. He then begins to find the corresponding nostril obstructed, and, perhaps, then only applies for advice. The cavity will, on examination, be found occupied by a soft mass, irregular or easily lacerable on its surface, when broken furnishing blood, and, at all times, a copious sanious discharge. After having burst through the parietes of the cavity in one direction, its progress is rapid and uncontrollable. Portions may be removed by the knife, ligature, or cautery, potential or actual, but the onward course of the tumour is continued. The teeth become loosened and fall out, the tuberous process is bulged backwards, the eye is found protruded, in the advanced stages, upwards and forwards; soft fungous masses, sometimes bleeding profusely without external injury, show themselves, to a frightful and disgusting extent, in the mouth, throat, and orbit, the features are terribly distorted, the patient becomes hectic, and dies very miserably. In the

very earliest stages of this disease, before there is reason to suppose that it has extended much backwards, it may perhaps be warrantable to attempt its entire extirpation, and thus afford the patient the only chance of escape from so certain and miserable a termination. The opening of the cavity and the attempt to clear it of the soft pulpy mass which occupies it, as formerly practised, is totally inadmissible; it is a piece of unmeaning and utterly useless cruelty. If anything is to be done, it ought to be set about with a thorough determination to go beyond the limits of the morbid growth, to remove the cavity which holds it, and thus get quit, if possible, of all the tissues implicated, or which may have become disposed to take on a similar action. I know from experience that this step, if adopted in time, may prove successful; but it is at least a doubtful and a very severe proceeding, not by any means unattended with danger; it is, however, the only remedy. Let it be borne in mind, that it is in the very earliest stage only that any benefit can accrue even from the thorough extirpation; very generally, the case is not presented to one who understands the nature of the malady and who is capable to undertake its treatment, who has courage to propose and to perform what is necessary, until it is by far too late. After the parietes have given way, and any growth appears in the nostril or cheek, the case is hopeless, and the patient, as of old were those who ventured on the ocean, may be numbered with the dead. A section of this tumour presents the bony cavity expanded and absorbed, and the cells filled with brain-like matter. This appearance may be pretty uniform, as well as its structure throughout, or there may be softer parts of the consistence of cream, putrid and mixed with masses of broken-down bloody clot, and here and there albuminous stuff may be met with; altogether, it deserves the terms applied by Pott, "a strange, distempered mass." Erectile tnmour, it is said, has been found occupying the cavity of the antrum of Highmore; I have not met with any such case, though many of the tumours which have come under my notice in this situation have been hæmatoid, have thrown out a fungous growth of bloody ap-

pearance, and furnished blood to an alarming extent; the hæmorrhages hurrying on the fatal termination, and moderated with great difficulty.

A tumour of a very different and much more manageable nature is encountered here. It is generally, though not uniformly, the result of external injury; it is slow in its progress and of very firm consistence; its surface presents a lobulated or botryoidal appearance, and is unbroken, even in advanced stages. If exposed to injury or irritation it may be slightly ulcerated, but, the cause being removed, the solution of continuity in the membrane which covers it is repaired. The internal structure is homogenous, and not very vascular; it is fibrinous, and sometimes distinctly fibrous; and here and there spiculæ of bone are felt in making a section. The whole mass is limited and surrounded by a dense cellular cyst, the neighbouring bones are displaced, and may, through pressure, be attenuated by interstitial absorption. In tumours of this nature, of long standing and large size, the zygomatic arch will be found thinned and converted into membrane, as will the parietes of the orbit and even the articulating processes, the ramus and body of the inferior maxilla. This firm and comparatively benign growth has its origin in the bone and its investing membrane; for the one cannot well be much affected without the other. It may commence from the outer surface of the parietes of the antrum, in any part of the alveolar ridge, and may, in the first instance, as in the case alluded to and figured at page 257, be of the nature of epulis, or it is possible that the inner fibrous lining may be primarily affected in some cases; the antrum may be obliterated, its walls may be squeezed together, but the mucous lining is unaffected. It may be seen, in some specimens, with its surfaces in contact, smooth and dry, the performance of its functions being no longer called for; in others, when the tumour has gained an enormous bulk, the cavity will still be discerned, but little narrowed, and with the mucous membrane in its normal state. To give an idea of the unlimited growth and monstrous size which these tumours attain without any conta-

mination of the neighbouring parts, the sketch of a patient, on whom a most successful operation was performed and permanent cure effected some years ago, is here introduced. This tumour

was attributed to a severe blow on the cheek, and it had been gradually increasing for a period of six or seven years; the old lady is now alive and in good health. The extirpation of this form of solid growth may be undertaken with confidence and with every prospect of ultimate benefit to the patient. The proceeding, as in every case of operation, great and small, is attended with a certain degree of immediate danger; but the patient and surgeon are warranted in incurring this risk in order to get rid of a disease so troublesome from its situation, and which, by its increase, must shorten the patient's existence. In the advanced stages even of this simple tumour, as can readily be understood, where the velum is covered and the pharynx almost filled, great inconvenience must be felt by the interruption both to deglutition and respiration. The suffering becomes unbearable, and if the patient can be assured that by an operation the whole disease may be extirpated and that he will afterwards enjoy an immunity from it, he will readily be

induced to undergo the pain and to take his chance of getting over the immediate effects, the loss of blood and the shock. If the proceeding is set about in a business-like manner, if the attachments of the bone in which the mischief commenced are separated, and the incisions made clear of the morbid structure, very little blood is lost, and the time occupied will be inconsiderable. Half measures are not admissible here. If the tumour be cut into, instead of being cut beyond, and taken clean out, there must necessarily ensue vast and alarming loss of blood, together with unwarrantable delay, and all to no purpose. Several of the patients on whom I have operated successfully, have been previously subjected to severe and ineffectual attempts at extirpation. The tumours had been nibbled at, portions grubbed out, and caustics and cauteries applied, till the patient has been all but exhausted. The diseased action, aggravated by these attempts, proceeded with greater activity than before, and a cure has only been accomplished under much more unfavourable circumstances, by the adoption of decided and effectual steps.

The operation for the removal of these formidable tumours, involving the bones of the face, must be well planned and considered before-hand, and proper instruments provided for the purpose. The extent of the disease is to be accurately ascertained, and the points at which the bones require to be separated, decided upon. If the os malæ be involved, and it is necessary to remove it, as well as the superior maxilla, a pair of straight tooth-forceps, a full-sized bistoury, copper spatulæ, powerful scissors, artery forceps, and needles for interrupted and twisted suture, will be sufficient. If the superior maxilla only, with perhaps some of the smaller bones, the inferior, spongy, &c., is to be removed, then the addition to the apparatus of a small saw will be necessary, for the purpose of effecting more readily the separation of the os malæ, somewhere near its anterior attachment.

Supposing that the more extensive extirpation is required, and it is not the more to be dreaded on account of its extent, incisions

must be made so as to expose freely the tumour and bones where it is proposed to cut them. First of all, one of the central incisors must be extracted, either the one on the affected side, or on the other, according to the extent of the tumour. I have been obliged to remove a considerable portion of the jaw, opposite to that principally affected, and in that case one of the molares was removed, in order to admit of the division of the bones. The

point of the bistoury is entered over the external angular process of the frontal bone, and it is carried down through the cheek, to the corner of the mouth, and guided by the fore and middle fingers of the one or other hand, as may be, placed in the cavity. A second incision is made along and down to the zygoma, falling into the other. Then the knife is pushed through the integument to the nasal process of the maxilla, the cartilage of the ala is detached from the bone, and the lip is cut through in the mesial line. The flap thus formed is quickly dissected up, and held by an assistant; the attachments of the soft parts to the floor of the orbit, the inferior oblique muscle, the infra orbital nerve, &c. are cut, and the contents of the cavity supported and protected by a narrow bent copper spatula. The division of the bones is now set about; with the forceps the zygomatic arch,

the junction of the os malæ and frontal by the transverse facial suture, and the nasal process of the superior maxilla, are cut in succession; then a notch being cut out of the alveolar process, the strong scissors are placed along the palatine arch, one blade in the nostril of the affected side, the other in the mouth, and that clipped through. Now it is that an assistant will be prepared to place his fingers on the trunk of one or both carotids, but pressure on both at the same time must be made with caution, for reasons given at p. 164. The tumour is now shaken from its bed, and the remaining attachments divided by the knife, as it is turned down; the velum palati is carefully preserved, and also, if possible, the palatine plate of the palate-bone. Perhaps no vessel may require ligature, the branches of the internal maxillary are elongated and torn from the tumour in bringing it down; in fact, if the mass is large, there is no possibility of reaching them with the knife. The patient is now removed from the sitting posture, which is the most convenient for all parties during the operation, and laid on a couch or table; the cavity is sponged out and examined. If any vessel is seen hanging in the wound, though it does not bleed, it may be tied, and the ends of the ligature cut off. The space which has been occupied by the tumour is then filled with lint, and the edges of the wound brought together by points of interrupted or twisted suture, but no dressing should be applied; it can answer, so far as I apprehend, no good purpose to wrap up the face in pledgits, plasters, and bandages. In twenty-four hours, some of the sutures may be taken out and replaced by narrow strips of the plaster; at the end of forty-eight hours the remainder of the stitches are cut, and the needles withdrawn—the whole track of the wounds, which will in all probability have adhered, being properly supported. A large void is necessarily left in the palate, but it is wonderful how soon and completely this is repaired, by the return of the bones to their original situation, and by the granulation and contraction of the soft parts. In many cases little is left for the dentist to do. The articulation will be rendered more perfect by fitting a plate of metal or sea-horse

bone, into the void; but this should not be attempted for a long period after the operation, and until the natural closure of the part has ceased. The gums and alveoli that remain, ought to be got into a sound state, and indeed the mouth should be cleared of stumps before the greater operation is undertaken.

The two sketches introduced above, show the appearance of a patient before and after the operation for the removal of a solid growth, involving the superior maxilla and os malæ, nearly two years ago. The case is related at length in one of the numbers of the "Lancet" for March, 1836, and in the Medico Chir. Transactions, vol. xx. p. 189. The patient now enjoys perfect health. For erectile tumour occupying the maxillary sinus, the ligature of the common carotid of the corresponding side, would be the proper practice. It is not to be supposed that this proceeding can have any effect in arresting the progress, still less can it be expected to lead to a cure, of those soft and malignant tumours described some pages back.

The surgeon, by studying well the nature and progress of growths in this situation, and in fact in all parts of the body, by losing no opportunity of making examinations, and thus gaining the requisite tact, will be able to predict pretty well their internal structure. He will not be under the necessity of resorting to, what in many cases turns out to be a very mischievous and hurtful interference, the thrusting into their substance of a long, flat, or round and grooved needle. I was consulted very lately by a gentleman labouring under a tumour, occupying the floor of the antrum, who had shortly before suffered very severely in consequence of this idle curiosity; the action of the diseased part was roused, and for some time after considerable increase of bulk had taken place. A day or two after this, a case of tumour over the distal end of the ulna, of firm consistence and very painful, from its compressing the dorsal branch of the ulnar nerve, presented at the hospital. There was the mark of a punctured incision upon the skin covering it. The nature of the case was represented to the young woman, and extirpation recommended. She returned to have this done in two days,

having a fresh mark of puncture upon it. The operation was performed, and inquiry then made, as to how this second mark had arisen. She confessed that she had gone to another hospital for advice, had the swelling explored, (the proper phrase, I believe,) and suffered, as she declared, in consequence, much more pain than that caused by the extirpation. The tumour was of solid and dense structure, somewhat larger than a filbert, and had a nervous twig entering into it. On its section it bore the marks of the punctures, being somewhat softened at one point, and bloody in appearance. Some days since, I removed a tumour, along with the little finger and its metacarpal bone, which had commenced in, and thoroughly involved, the proximal phalanx and adjoining articulation; it was soft, brain-like, and of large size. The patient had suffered considerably, and the progress of the disease was doubtless hurried on, by no less than eight or nine punctures, made at different periods. The practice of exploring tumours may be warrantable in some few very obscure cases, in which the diagnosis would otherwise be difficult and imperfect, but its general and indiscriminate employment by all practitioners cannot be too much or too strongly deprecated, and must lead to any but favourable results, so far as the comfort and welfare of patients are concerned.

The morbid growths which proceed from and involve the lower jaw-bone are also of various kinds and consistence; the further these, and the tumours of any bone, in fact, differ from the original tissue, the more are they to be suspected, the more apt are they to follow a rapid and unfavourable course, and to be reproduced, either in a part of the bone or discoloured integument which may have been left, or in the soft parts which have invested it. The most simple tumour is that which has its origin on the surface of the bone or periosteum, of a fibrous or fibro-cartilaginous character. It may be produced by external injury, or it may be traced to inflammation, commencing in the sockets of the teeth, and their investing periosteum and gum, and perhaps succeeded by suppuration, which is repeated from time to time. The case is at first one of simple parulis, but the cause

being permitted to exist, thickening from repeated inflammatory attacks takes place. Although the excitement be at this stage removed, the crowded teeth, and decayed portions extracted, the diseased action is often not arrested. The solid, hard, and unyielding swelling, gradually progressing, at last begins to appear externally, and produce deformity; it bulges also into the mouth, and impedes the free action of the parts. After a time, more and more of the alveolar ridge, and of the body of the bone, become affected, and the teeth are displaced and loosened.

There is a risk, too, of the action in the morbid mass changing to a malignant form, degenerating and softening, rapidly increasing and contaminating the neighbouring tissues. Many tumours of the lower jaw are from the first of a suspicious character, and their onward progress is alarmingly rapid. They commence between the lamellæ of the bone, as a consequence, very generally, of the irritation of stumps, and the formation of soft fungous masses from the apices of the diseased teeth. Cysts containing serous or glairy fluid are often met with in these masses. The plates of the bones are expanded, thinned, and soon involved in the morbid structure. Tumours, whether of the firm or soft kind, have their seat most frequently in that part of the bone which lodges the molares. It may commence and extend from near the symphysis to the angle, or it may even spread beyond the mesial line, or involve the greater part of the ramus. No therapeutic means, general or local, can check the growth of such disease, far less promote its discussion. Recourse to the knife offers the only chance to the patient; the earlier, therefore, this step is taken, and the more free the resection of the bone, the greater will be the chance of a favourable termination, and of a thoroughly permanent cure. There is more danger perhaps, upon the whole, attendant upon the removal of the symphysis, than of the ramus and articulating processes. The detachment of the anterior belly of the digastric, of the genio-hyoid, and genio-hygo-glossi muscles, is apt to be followed, unless great precautions are taken, by retraction of the os hyoides, and tongue, and a sudden interruption to respiration. In some of the more simple and smaller

tumours of this bone, in that, for instance, described under the name of epulis, it may be possible to save the lower rim of the bone, and thus prevent more effectually the deformity arising from the drawing of the chin to one side. The bone on each aspect of the tumour is cut down with a fine saw, to a sufficient depth to admit of the safe and effectual application of a pair of cross-cutting forceps. A free exposure and examination of the part must be made, so that no doubt may remain as to the perfect soundness and integrity of the portion to be left, with a view of exposing the bone, so as to effect partial removal, to perform resection, (to cut through the bone at two points and remove that along with the morbid growth,) or to effect the disarticulation, the incisions must be so planned, as to leave as little deformity as possible. The line is here seen upon the tumour, and its cicatrix

after the cure; the artist has, as is no uncommmon occurrence, flattered the lady a little, the flatness of the cheek and the slight twist of the face are, therefore, somewhat disguised. To illustrate the operation, we shall suppose, that the tumour involves nearly one side of the bone, and that division near the symphysis and disarticulation is to be performed. An incision is made

from the condyloid process, down the posterior border of the ramus and along the lower margin of the bone, and terminates above the point of the chin, in the mesial line, at about an inch from the free edge of the lip. The flap so formed is dissected up, the membrane of the mouth divided on each side of the bone, and the tumour thus perfectly exposed. Another incision about an inch and a-half long, may then be carried in the course of the external carotid, and made to meet the other opposite the angle of the bone. A tooth, say the central incisor of the affected side, having been previously removed, a small saw is applied so as to cut the bone to the required depth near the symphysis, the cutting forceps are placed in the notch, and the bone clipped through. The cut end is now laid hold of, the tumour depressed, and the attachment of the temporal muscle separated from the coronoid process. The masseter muscle has been detached along with the coverings of the tumour. The bone being thus thoroughly loosened, the articulation is opened from before and by carrying the bistoury close to the bone, the pterygoid muscles and other attachments are also divided, and the operation completed. The bleeding is now arrested by ligature of the vessels, and much time and trouble will often be saved by at once looking for and securing the common trunk of the temporal and internal maxillary artery, as it emerges from under the border of the posterior belly of the digastric muscle. Effectual means being taken for the arrest of hæmorrhage, a bit of lint is placed in the wound, and the flaps lightly replaced. Some hours (from five to eight) after the operation, the edges of the wound may be neatly approximated and retained; excepting the middle part for a short distance, to permit the passage of the ends of the ligatures. Through this opening the discharges of mucus, saliva, and serum, which are very fœtid, escape, and swelling is prevented. Previous to the operation, it will be found of great use, as suggested by my friend, Mr. Nasmyth, of Edinburgh, to have metallic caps fitted to the teeth of the upper and lower jaws of the sound side. These are rivetted or soldered together at their bases, so that when applied, they shall have the effect of preventing the drag-

ging of the remaining portion of the bone and chin, to the opposite side, by the external pterygoid, mylo-hyoid, and digastric muscles, and by the elasticity of the soft parts. This apparatus should be worn pretty constantly for many weeks after the operation, and has been found exceedingly useful in several of the cases in which I have performed disarticulation. The mark of the incision made as recommended above, can be almost completely concealed, more especially in the male.

Tumours of the neck are variously situated as regards their coverings, and the numerous important organs in that region. They may be superficial, and though of alarming and very inconvenient size, as here shown, may have loose attachments, and may be

comparatively of harmless character. The tumour above represented, I removed fourteen or fifteen years ago, from a very respectable middle-aged man, who, I believe, has since enjoyed perfect health. The swelling first appeared under his chin, and his neighbours joked him about his jolly appearance, supposing that it was merely an accumulation of fat in the cellular tissue. It was fat sure enough, but an adventitious and independent deposit. The swelling was attributed by the patient himself, a

plough and cartwright, to the pressure of his brace. The tumour gradually increased for twelve years or more before he applied for advice. The base extended from the chin to the sternum, but after the division of the integument, sufficient being left to cover the exposed surface, very little dissection was required. The various lobes, of adipose matter, were drawn from the loose cellular connexions, which were here and there touched with the edge of the knife, as they offered resistance. Some of these lobes passed pretty deeply by the side of the larynx and upon the sheath of the vessels, but all were placed above the deep fascia. A variety of fatty or fibrous tumours on the fore and lateral aspects of the neck, some fully equal in size to this one, have been presented to me and removed successfully, without any very difficult or dangerous dissection. In fact, as the tumour attains great bulk and weight, the attachments are elongated and the mass is thus removed from important parts. There is no difficulty, when dealing with these simple tumours, in saving sufficient integument.

The tumours which lie in either of the triangular spaces of the neck, which are bound down by the platysma-myoides and fasciæ, and dip deeply, must be carefully examined, and their connexions well considered, before any attempt at removal is proposed or undertaken. Their consistence, duration, and probable disposition, will, and ought to have, considerable influence in guiding our decision. The fixation and immobility of the tumour may depend upon firm adhesions to the subjacent parts; or, again, it may in some measure be accounted for, by the tension and pressure of the coverings. These may be somewhat relaxed by position, and further examination instituted. Should the tumour have been of slow growth, if it presents a firm consistence and defined margin, and is tolerably moveable, if there be reason to suppose that its attachments to large vessels, veins more espepecially, or nerves, are not very intimate, then its extirpation may be attempted. This will be the more justifiable, if the tumour, by its bulk or awkward position, is beginning to interfere with the functions of respiration or deglutition. An instance

of dissection, most thorough and complete, of the side of the neck, and the greater part of both the superior and inferior triangular spaces, is already detailed in Chapter V. These irregular operations require, on the part of the surgeon, correct anatomical knowledge, prudence, coolness, decision, and some share of dexterity, qualifications to be gained only by practice and experience.

The tumours over the parotid, and behind the ramus, and angle of the jaw, deserve some notice. These, whether enlarge-

ments of the lymphatic glands, or adventitious formations, are bound down by a strong condensed cellular sheath or fascia, and also by the fibres of the platysma-myoides, which pass upon the side of the face. Their growth and prominence externally, is equally extensive among the deep-seated parts. The parotid gland is displaced and absorbed; the diseased mass is imbedded in its substance and ultimately occupies its place. The vascular supply is abundant, and the nerves become intimately attached to the posterior surface of the condensed cellular cyst. The tumour is firmly fixed in all ways, by its strong investments, firm adhesions, and by its being, as it were, dove-tailed by its processes between the bones. I have sometimes, after the removal of tumours

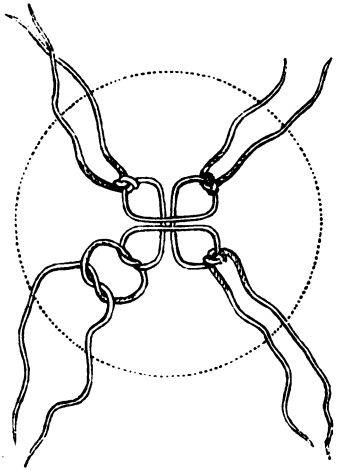
of long standing in this situation, found exposed the whole cavity betwixt the mastoid process and the ramus of the jaw, the styloid and pterygoid processes, muscles, &c. The interference with these growths, parotid tumours as they are called, (though the parotid gland, I believe, is not itself very subject to disease, it must be extremely rare at all events,) requires no small degree of consideration; if there be reason to suspect that the disease is of a malignant nature, and not thoroughly limited by a cellular cyst, no interference is admissible, If, on the contrary, it be at all moveable, has advanced slowly, possesses a smooth surface and is firm, (neither of stony hardness nor pulpy,) then the operation may be contemplated. A very free division of the super-imposed parts is essential to the success of the proceeding. For this object a perpendicular incision is first made, and others added so as to form two or more flaps; the incisions must penetrate to the substance of the tumour, and divide its immediate investments: it being a more easy matter to turn a diseased part out of its cellular cyst, than to dissect that out from the parts to which it adheres, and from whence it draws its supplies.

The dissection should now be carried deeply to the lower boundary of the disease, where the vessels are known to enter; these will at once be divided and compressed, or tied if it be thought worth while, if the vessels be very large, or the fingers of the assistant are in the way of the further, and perhaps more delicate, dissection; this is pursued much more safely and satisfactorily thus, and it will be found always much better to meet the danger at once, than to be obliged to tie one vessel after another, and perhaps the various branches over and over again instead of the trunk; much less blood will be lost, the time occupied in the operation will be abridged, and the pain and suffering very much diminished; as much, in point of fact, may thus be effected, and with more safety, in five minutes, than can be done in fifty when it is improperly conducted. The utmost care must be taken to avoid the branches of the cervical nerves, and those of the portio dura of the seventh pair, by dissecting the posterior aspect of the tumour carefully, and in the direction of their course, the edge and

point of the knife being constantly turned towards the part to be removed; but in some cases of this kind, the division of part of the pes anserinus is quite unavoidable, and we shall have sometimes, in the midst of the proceeding, to decide between leaving part of the tumour, and causing a temporary paralysis of part of the face. The smallest fragment of the most simple tumour will form a nucleus for a fresh growth. The possibility of its being necessary to divide branches of nerves, and its effects, must be made fully apparent to the patient before any attempt to remove the tumour is made. The character of a fibrous tumour in this situation is shewn above, p. 274. In the after treatment and dressing of the wound, the principles already laid down will be the surgeon's guide.

Enlargements of the thyroid body cause much deformity, but they are generally unattended by suffering of any kind, or interruption to the functions of the organs which they cover and invest. The tumour is lobulated, soft, and apparently very moveable; it follows the larynx in its elevation and depression; its surface is covered by a loose cellular sheath, and by the expanded thyroid muscles; its arterial supply is excessive, and the veins are large and full. Any attempt to remove the mass by incision has, as might have been anticipated, been attended with frightful and, almost uniformly, fatal hæmorrhage. The separate ligature of the vessels has been attempted, but with no advantage. No operation is justifiable in such cases merely for the removal of deformity; but it happens occasionally that enlargement of part of the gland, as the isthmus or middle slip, gives rise to difficult respiration, to fulness of the vessels of the brain, and an alarming train of symptoms; under these circumstances the offending part, if it have resisted the action of iodine and other deobstruents, may be made the subject of operative procedure. The introduction of a seton has been resorted to, but this practice is not unattended with risk, and its operation is slow and uncertain. I have more than once removed large portions of the thyroid body, which had caused serious inconvenience, and with the most perfect safety, by combining incision and ligature. The accompanying sketch exhibits the situation and character of bronchocele well;

the scar upon its surface shows where a tumour, nearly equal in size to that remaining, and which caused much annoyance from its pressure and projection, was removed from, in the manner here described. The coverings of the tumour are divided fully and turned back, the dissection is continued towards the base of the mass, as far as it can be done with safety; strong needles fixed in handles, as represented p. 282, are passed underneath, from above downwards, and from the side, crossing the first at right angles, care being taken not to wound or include any part of importance. Very strong ligatures are drawn through in the loops of the first introduced, and these are tied on each side, or the ends are secured all round, the one to that next to it, whilst the ligatures are tightly held; by the pulling and securing the last very tightly, all the knots are drawn together under the tumour, as represented in the sketch on the next page, so as to strangle it effectually; in fact, the four ligatures are knotted in such a manner as to make one, and by drawing the last two ends tightly, the strangulation is rendered complete. The reef-knot must be used for this purpose, and even a third knot should be made to prevent the ligatures slipping during the firm and strong pull upon the last two



ends. In passing the ligatures under these and other tumours, it is advisable to introduce the first needle unarmed; then beneath it to pass a second carrying a ligature; the loop of the ligature is taken hold of, and this second instrument withdrawn; the first one is now threaded, and by its removal the second ligature is carried through; by this means their entanglement is avoided.

Vascular growths, tumours, composed of a congeries of varicose vessels, or of the nature of erectile tissue, (so accurately and admirably described by Mr. John Bell, and named by him aneurysm by anastomoses,) in this and other regions of the body, can only be removed with safety in the manner here described. The tumour may occupy a situation, as the orbit antrum or temporal fossa, in which it is unapproachable and cannot be directly attacked, and then the experiment of cutting off the vascular supply by ligature of the trunk going to the organ affected, may be had recourse to; the practice has been successful in the hands of Messrs. Travers, Dalrymple, and Busk. I assisted a very good surgeon, Mr. Paul, of Elgin, in securing the common carotid for a most extensive aneurysm by anastomosis of the scalp, some years ago, and the progress of the disease was in consequence arrested.

Both carotids have been tied in a somewhat similar case by Dr. Mussey, in America, whose acquaintance I had the pleasure of making. A case is mentioned elsewhere in this work, in which both linguals were tied with partial success. When the tumour can be so far insulated, and its circulation effectually and perfectly interrupted, so that the adventitious structure shall perish and be separated, a successful issue may be much more certainly predicated. The operative procedure must be modified according to circumstances,—to the size and situation of the affection, and the tissue in which it is situated. It is met with in exposed parts of the body, most frequently about the head, face, and neck; it is seen on the trunk, on the parts of generation, on the extremities; I have seen it again and again involving the entire structure of a toe or finger. It may consist merely of discoloration of the surface, more or less red or blue, a mother's mark or nævus extending superficially; it may involve the subcutaneous cellular tissue to some extent, or it may be situated entirely under the skin, with or without a trifling discoloration, forming a tumour, soft and doughy or woolly and compressible. Some of these tumours are much more active than others; they swell out when the circulation is excited, as when the child cries; for it is an affection most frequently treated in childhood, and it generally increases with great rapidity.

Some of these tumours communicate a thrill to the fingers; they can be emptied so far by uniform and continued pressure, or by interrupting the circulation, and are instantly filled on permitting the blood again to flow into or towards them. Some of the marks involve a considerable part of the mere surface, without any activity of circulation, without any swelling, and remain in the same state during the whole period of life; perhaps the redness may become more intense when the circulation is excited by any means, by exercise, &c., or at particular periods in the female constitution. A distinction must be made in practice betwixt the mere nævus, the discoloured spot without swelling, and the subcutaneous vascular or erectile tumour, with or without inclusion of the cutaneous tissue. Some of the mere marks, from their extent, cannot be interfered with: if small, an attempt may be

made to cause an obliteration of the vessels of the surface by vaccination on the spot, by the use of the potass or other escharotics. These and other means, such as acupuncture, injection of stimulating fluids, and setons, have been tried, even in the subcutaneous tumour; and a partial cure may have, by chance, been effected. But they are not to be depended upon, and are at best very tedious processes; serious consequences have followed some of the attempts.

I have seen cases in which most profuse and alarming hæmorrhage had followed the boring into erectile tumours with strong potential cauteries, and in which, after all the pain, danger, and delay, no benefit accrued from the practice. In fact, I have been repeatedly called upon to interfere in cases where some nine or ten ineffectual attempts, by the methods alluded to above, and even by ligature ineffectually applied, had been previously made; some few of these cases, as occurring in hospital practice, have been reported in the "Lancet," from time to time, and a long list might be added, if necessary. Pressure has been applied on the surface, but it has seldom been found possible to continue it long, nor has it ever answered any purpose, even when the tumour was favourably situated. Mr. Bell recommends strongly the excision of the affected tissue, and has well laid down the principle which should guide the surgeon in his proceedings upon tumours freely supplied with blood; he cautions him against cutting into or near the morbid structure, if he wish to avoid troublesome or dangerous bleeding and free the patient completely of the disease.

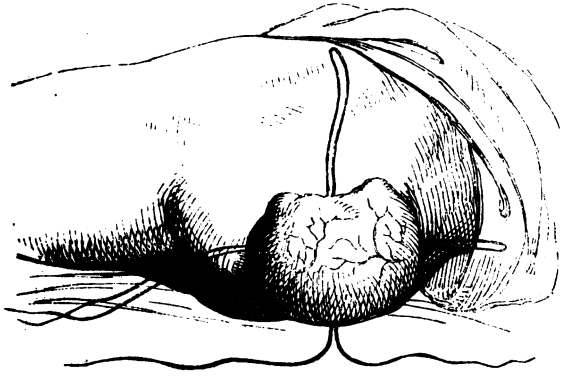
Some small and trifling erectile tumours, favourably situated, may be removed by the knife, but it is not a safe practice, and an instantly fatal result from hæmorrhage has more than once followed the attempt. In children it is seldom admissible, for, as is well known, they bear the loss of blood badly. The mode of removing this disease by ligatures was well known to Mr. Bell, and it has been followed by Messrs. A. White, Lawrence, and a variety of others; some cases, by the gentlemen above mentioned, are published in the Medico-chirurgical Transactions. The ligature cannot be applied with propriety when the skin is much

affected; and when extensively included, the strangulation of the mass can only be effected by slow degrees; the tumour perishes only from inflammation and from deficient power in the part; deformity besides is produced. This is a very painful and tedious process, but it may be accelerated by the application of fresh ligatures from time to time. The ligature alone is applicable in some instances, as where the diseased part is small, prominent, and nearly the whole of its covering is involved. The object must be to remove the adventitious tissue thoroughly, so that there shall be no return. Should it be impossible to include it entirely, or should some small portions be by chance left out, it may possibly happen that its vessels shall be closed by fibrinous deposit, but this is not to be depended upon; reproduction of the disease has too often followed operations thus imperfectly performed. The morbid structure will spring up again rapidly from a small spot, and the only safe and satisfactory plan will be found to consist in a thorough inclusion of every affected and suspicious part by the ligatures. When the skin is, of necessity, to be tied with the tumour, one or more ligatures are to be passed underneath. A double ligature, carried by a common suture needle, or by the instrument represented below and recommended for the purpose in treating of bronchocele a few pages back, will answer perfectly. The loop is cut and one portion tied on each side, in order to make the ligatures embrace the base thoroughly; a second needle, or hare-lip pin, may be thrust across in the opposite direction and removed after the threads are drawn and fixed under them; or the pin may be clipped short and left to come away with the threads and tumour. This mode I have followed with good success for a series of years and in numerous cases. When the skin is slightly or not at all affected, and the subcutaneous tumour is large, the covering should be turned back, as here represented, and the ligatures then employed. I operated for a tumour in this situation a few weeks ago, on a little girl who had been subjected to several unsuccessful operations previously. One needle, that across the morbid mass, was in the first instance introduced without a ligature, after the incisions had been made;

the tumour was raised by means of it, and the second needle passed underneath the first, carrying a strong thread; the loop of this was laid hold of with a hook, and the needle withdrawn upon the ligature, as here represented. The first needle was then armed also, and the double ligature brought through with it. These were then secured in the manner described and delineated, p. 278.

This mode is very superior to those generally followed, and is not liable to any objection. There is no risk of bleeding in cutting through the skin, and dissecting back the flaps from the tumour. Of course these are made, so as to leave any portions of skin that may be at all affected, still attached to the part to be removed; the mass is thoroughly exposed, so that the ligatures can be introduced completely under and beyond it in all directions, and these can be drawn at once so tightly as to cut off its connexion with the circulation, and destroy its sensibility and vitality. The operative procedure is necessarily varied, according to the circumstances of each particular case. The principles being understood, the details must be left to the judgment and discretion of the practitioner concerned. After the tumour is strangulated completely, free puncture may be made into it, so as to diminish its bulk. The painful feelings may be soothed by sedatives suited to the age and condition of the patient, and warm water applied

to the part as described again and again in the foregoing pages. By following this method, the period necessary for a cure is much abridged; there is less suffering entailed on the patient, deformity is avoided, and the operation is without doubt more safe and certain than any other.



A case of tumour of the hip, of which the accompanying cut gives a very accurate idea, was lately brought to the hospital by my old friend and pupil, Dr. C. Underwood, of Ross. The patient, aged 67, had for some time perceived a small tumour, of the size of a nut, upon the right hip. He attributed it to the irritation caused by a truss which he wore for a large and troublesome hernia. The swelling had gradually increased, causing great pain and uneasiness, until it attained the size of two fists. It appeared to consist of a congeries of blood-vessels, which pulsated distinctly. By constant and equal pressure the tumour would be lessened to half its bulk, but, upon the pressure being removed, it quickly resumed its usual size. Some weeks before he was brought to the hospital, an incision was made wide of the swelling, with the view of afterwards embracing its base by ligatures; but the hæmorrhage was so violent and alarming, that after it had been arrested, and this was accomplished with difficulty, by the application of the actual cautery, the attempt to remove it was for the time abandoned. Instructed by this occurrence, and, after mature deliberation, having talked the matter over with Dr. U., I determined upon attempting its

extirpation. The mass was lifted from the subjacent muscle, and a long and strong needle thrust under it; another, armed one, was passed across in the opposite direction, small and firm whip-cord was drawn through, by means of the silk ligatures carried by the needles, as shown in the figure. These being arranged, an incision was made, betwixt two of the ends, through the skin; these were tied firmly, whilst the other ends were held tight. The others were then tied round in succession, incisions being also made betwixt their points of insertion, so as at once to strangle the circumvented mass. This operation was effected with the loss of not more than three ounces of blood, and much more effectually, and with less pain, than if the incisions had been omitted. The skin covering the tumour was firmly adherent throughout and pervaded by enlarged vessels, so that none of it could be saved. The exposed surface was therefore large, and slow in healing; the chasm was also pretty deep, the fibres of the glutæus maximus being deprived of their fascia. The appearance of vascular tumour, at this period of life, is uncommon, and this one came up to the description given by the late Mr. John Bell of aneurysm by anastomosis more thoroughly, in all respects, than almost any other I have seen, as regarded the active pulsation, compressibility, and the hæmorrhagic disposition in the vessels going to it. The patient returned to Herefordshire, some time ago, in pretty good health and without the slightest appearance of any regeneration of the morbid growth.

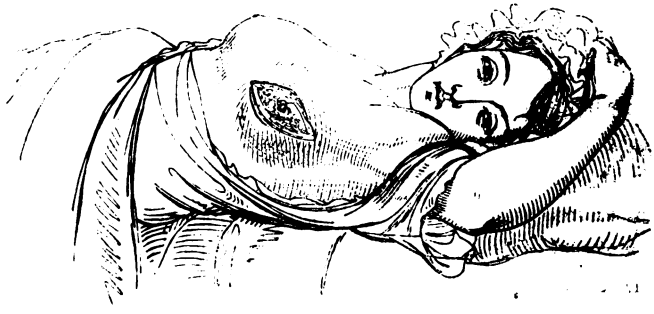
The female breast is unfortunately the seat of disease, and very often of such a nature, and, when discovered, in such an advanced state, as to be perfectly irremediable, even by surgical means. The mammilla of the male is also affected in a similar manner, though far more rarely, for reasons well understood. The enlargements and indurations of the mammæ in young persons, can in general be removed by attention to their general and female health. The affections of the gland, which most frequently show themselves in later life, at or before the critical period, may be thus palliated and somewhat retarded in their progress. Some simple enlargements may become quite stationary, and cease to give

inconvenience or anxiety, whilst others may even be induced to disappear entirely by judicious management, and by a perseverance in general and local means. The greater number of these tumours, sooner or later, as is well known, exhibit signs of malignant action. The hardness increases, the nipple is retracted, and fixed to the body of the gland. The skin and lymphatics become contaminated, the form of the breast is lost, it often shrinks and contracts adhesions to the subjacent parts; or again, the gland enlarges rapidly, presents a smooth and uniform, or irregular and lobulated, surface, and feels soft and pulpy.

Ulcerations take place at a late period in either case, from the surface round the nipple, or in consequence of the progress of some bloody and unhealthy secretion from within. It is impossible here to enter on any description of the internal and intimate structure of these morbid masses. The progress, appearance, and feel of the tumour, coupled with the period of life, will leave no doubt in the mind of the practitioner, as to its nature. We have, as yet, no means of stopping or controlling diseased action, or of freeing a patient from a cancerous encephaloid, or cystic degeneration of this or other organs. Recourse may be had to the knife in some cases, but the circumstances must be very favourable indeed, to induce a surgeon to recommend or warrant him in undertaking any operation for the removal of malignant disease. It is only in the very early stages, before the skin is affected, and when as yet no trace of affection of the lymphatics can be detected, that any permanent benefit can be expected to accrue from the extirpation of the affected mammæ. When the disease has been of some standing, there is considerable risk of the axillary glands having become contaminated, and of their taking on diseased action at some future period, many months, or even years, after the excision of the original disease. No one could now be found so rash or cruel as to attempt the removal of glands thus affected, either primarily or secondarily. After the lymphatic system is contaminated, there is no possibility of ascertaining or getting beyond the limits of disease.

When found necessary to excise the mammary gland, the patient

should, if possible, be in a sitting posture, well supported by the nurse, or an assistant, in order to prevent her from slipping down; a jack-towel may, to prevent this accident, be placed over the fore-part of the pelvis, and tied behind the chair. The surgeon and assistants place themselves conveniently on each side; if he can use either hand equally well, the operator may always, on which-ever side the disease is, stand behind the patient, so as to be out of the way of the bleeding-vessels, by which his sight may other-wise be now and then obstructed, and the operation thus inter-rupted and protracted. The skin is stretched, and an incision made from over the border of the pectoralis major, somewhat in the direction of its fibres, and under the nipple, which must always be removed, as well as the whole gland, whatever part of it may be diseased. The surgeon or assistant then puts his fingers on the part to be extirpated, another incision is carried from the end of the outer third of the first cut, to the beginning of its inner third, and the nipple is included in two elliptical incisions thus.



The extent of the two incisions, and the points at which the one falls into the other, must depend upon the size of the tu-mour, and on the degree to which the adhesion around the nipple has taken place. The first and essential object in ope-rating in cases of suspicious or decidedly malignant disease, must be to rid the patient of the whole of the morbid mass; the next is to make the incisions in such a manner that they shall come together readily, that they may adhere and heal rapidly, or at least that as small a surface as possible may be left to be repaired by the granulating process. The dissection of the tu-

mour, with abundance of its cellular and fatty investments, is proceeded with; it should be raised, and the lower and outer surface thoroughly detached; the incisions, in short, should be made at once deep where the principal vessels enter. These are compressed, after one side is well separated down to, and from the subjacent muscle; the attachments of the upper part are in like manner divided by a few sweeps of the scalpel or broad bistoury, great care being taken not to encroach in the least upon the disease. The cut surface of the part, after its removal, must be wiped and closely examined, even before all the vessels are tied, and if there is a suspicion existing of any part at all altered, still remaining, that must be discovered by comparison with the divided parts, and forthwith removed without hesitation. This is a disease in which no half measures will answer; and if a patient has made up her mind, after a severe struggle, to submit to the pain and risk of a very dreadful operation, in the expectation and with the view of saving herself from after-suffering, and enjoying an immunity from a terrible disease, it is not fair, from any slovenliness or carelessness to throw away a chance, or in any way endanger a recurrence of the mischief. The operation is one which must be gone about deliberately and conscientiously, as ought to be the case in undertaking operations of any kind, and in any situation. The duration of the proceeding must not be considered. Many operations can be done well, and quickly too, and fully as well when quickly done. This is not one of these; the extirpation should be set about with a thorough determination to free the patient of the whole diseased structure. There should assuredly be no unnecessary delay, no tumbling of the tumour, first on one side and then on the other, or stopping to tie vessels. The dissection should be proceeded with methodically and deliberately, the parts being examined by the fingers and eye as it proceeds. With all due caution and deliberation in the proceeding, it may be completed within a very few minutes; but, as above remarked, the time occupied must not enter into our consideration. This object being accomplished, the

diseased parts being entirely removed, all the vessels that show themselves are tied. The arm which has been abducted during the operation, and held by an assistant, in order to keep the parts in a favourable position, and on the stretch, is now placed by the side, and supported by a sling; a point of suture or two may be inserted, and cold water applied. The oozing having ceased, a few plasters are applied, but complete adhesion need not be expected, it being impossible altogether to prevent motion of the parts. The stitches are early removed and the warm water dressing applied, followed by lotions and gentle support from bandage and compress below the incision. Dressings and bandages will do harm, in the first instance, and cause great annoyance.

The tumours met with on the trunk of the body are entirely new formations and are generally of a benign nature, as the adipose. They are met with on all aspects; they are generally subcutaneous and loosely connected, and sometimes attain an enormous bulk. Occasionally they are pendulous; I have met with two such betwixt the scapulæ, which, from pressure, seemed to have changed their structure; they had become pulpy and brain-like. These tumours are occasionally inflamed and condensed from pressure, and contract very firm adhesions; from the application of stimulants and escharotics the same unfavourable changes take place. In several instances I have experienced difficulty in extirpating adipose tumours from the back of the shoulders and neck, in consequence of their being thus altered in their circumstances. Fatty tumours are sometimes, though rarely, met with betwixt the layers of the abdominal muscles; they are not to be mistaken for chronic abscess, which occurs also in this situation; the duration, the consistence, and some hardness about the base, will mark the fluid collection. Experience and tact are essential in forming a diagnosis in such cases. The chronic abscess at the lower part of the region shifts its place: it lies often betwixt the muscles and tranversalis fascia; after a time, slips under the ligament of Poupart, betwixt it and the crural arch, and

separates the two layers of the iliac portion of the fascia lata. It thus appears outside, and superficially, to the femoral vessels. A fatty tumour does not follow this course.

Fibrous tumours are sometimes, though rarely, seated on the neck, and I have removed a few from the axilla. Upon the back I have more than once seen soft and medullary-looking tumours. The tumours of the trunk, however, are almost always superficial, loosely connected, and simple; they are easily removed, though they may have attained a large size, and they are but sparingly supplied with blood. Skin is saved to cover the solution of continuity, and the incisions are made as much as possible in the direction of the fibres. The cure will generally take place by the second intention; the edges of the wound may, however, be retained in contact for a time. I have often had wounds, made for the removal of fatty tumours from the shoulder, chest, and anterior part of the trunk, heal without the escape of a drop of matter. But on the posterior aspect of the neck or trunk this need not be looked for; the secretion of matter is favoured, and the part kept comfortable, by the simple water-dressing.

The treatment of tumours of the scrotum, caused by descents from the abdomen, by accumulation of fluid in the tunics of the testis, and by disease of that gland, will be considered in some of the following chapters. The solid tumour represented in the next page, as stated in a former part of the work, occasioned by infiltration in the cellular tissue, with, at the same time, some hypertrophy, of the skin of the scrotum and penis. The warty mass at the lower part is the prepuce so altered, together with the termination of the raphe. The tumour is a simple enlargement of the coverings of the testis and penis, which are buried in the mass. The disease is almost unknown in this country, and so far as I know, the above sketch is taken from the only case occurring in a resident native of these islands. The tumour had been growing for twelve years, when the patient, then about twenty-two or twenty-three, applied for assistance. I undertook, at his urgent request, the amputation of the diseased mass, and it

proved perfectly successful. This operation was performed many years ago, the patient now enjoys perfect health and is capable of any exertion. The disease commenced before puberty. It was impossible to say where the organs of generation were placed in the mass; if they could have been found and saved, I should not have been able to cover them; they would have thus totally been unserviceable, and I looked upon it as a matter of no great consequence whether they were preserved or not, in this particular instance. In point of fact, I was more anxious to save the patient's life than concerned about preserving his organs of generation; in trying to save these, it was more than probable that I might have lost the man, from hæmorrhage and protracted pain. So impressed, I had the patient placed with his back to the light and resting over the side of his bed; with a few strokes of a long bistoury, the mass was detached from the perineum and pubes, together with the testes and about two inches of the penis. After some vessels had been tied, he was laid in the recumbent position, and the rest secured to the amount of twelve or sixteen. Nothing occurred to in-

terrupt his recovery. The tumour weighed nearly fifty pounds, and is to be seen in my pathological collection. Attempts have been made to dissect out the genital organs from similar growths, and to make a scrotum and other appendages; the results have not been satisfactory. The disease is common amongst the natives of warm climates, in some of the West India and South Sea Islands, and often attains a much greater size than in this instance. Larrey met with several cases in his Egyptian Campaign. A similar tumour grows from the labium pudendi. I have had occasion to remove several, and one of these, composed of various lobes of great size, must have weighed, at least, ten or twelve pounds. After these tumours attain a certain size, and become pendulous, their increase is very rapid indeed; the return of blood is slow, and infiltration goes on apace; their supply of blood is, besides, very ample, and this must be thought of in determining upon the operation. Encysted tumours of slow growth, and containing generally a brown, very fetid fluid mixed with flakes, occur also in this region in the female. They are loosely connected and easily turned out, without the removal of their covering of integument or the lining membrane of the labium. Abscesses in this situation are commonly pretty acute, and those of a chronic kind observe a different course and have not the uniform and globular or ovoid form of the real tumour.

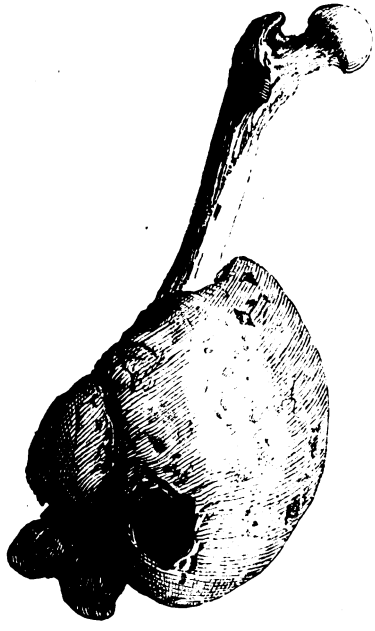
The extremities are not very often affected by tumours of the soft parts, and like those of the trunk, when they do occur, they are of a simple kind. The shoulder is not unfrequently the seat of adipose tumour, and in the upper arm it is also met with; I have seen these of large size, and removed them from under the fascia and from the intermuscular cellular tissue. More than once, fatty tumours, in considerable numbers, upon the upper extremity, have been shown to me, which were stated to have appeared within an exceedingly short period—two or three months—and without apparent cause. I removed several of those which were awkwardly situated, and interfered with the motions or position of the limb, from a man in the Royal In-

firmary of Edinburgh; some twelve or twenty must have remained. A patient, some time ago, was under the care of my colleague, Mr. Cooper, with a similar affection, in the North London: and, at present, there is a middle-aged female in the Hospital studded over with hard tumours. Encysted tumours are sometimes seen on the extremities superficially situated, and occasionally also tumours and ulcers of a bad kind occur. These latter generally proceed from the cutaneous tissue; they may be dissected out at an early period, and also in their advanced stages, if the lymphatics appear to be unaffected; amputation of the limb may even be called for. Some tumours of the fingers and hand will be treated of in the next chapter.

The tumours of the extremities are very generally of a grave nature, commencing in the bone, in its cavity, or cancellated texture, or on its surface. Generally speaking, the tumours from the central cavity or meditullium are soft, increase rapidly, give rise to thinning and expansion of the bone, and absorption of the earthy matter. The bone, if it have a long shaft, is apt to bend under the weight of the patient, or in consequence of muscular exertion. The onward progress of the disease is thus generally much increased. The section of these growths is greasy and brain-like, often broken down and mixed with blood; the tumours from the surface are firm and fibro-cartilaginous or bony.

Cellular exostoses seem to have their origin occasionally in the heads of bones, to be a sort of hypertrophy of the original cancellous tissue, covered outwardly by a dense shell. These hard tumours grow more slowly and may even become stationary; it is sometimes only after a long series of years—twenty, thirty, or forty—that they attain such a size as to prove no longer bearable. Tumour on the shaft of a bone, if not exposed to injury, may thus be long submitted to; but if seated near a joint, or if excited and the growth is rapid, or in such a direction as to interfere with the motions of the limb, then recourse must be had to operative procedure for its removal. Amputation of the limb offers the only, though doubtful chance of cure, and that

must be undertaken at a very early period in the albuminous, medullary, soft and rapidly growing tumour—the osteo saccoma, as it is called; it is the only remedy, also in the end, for the exostoses of large size and for the fibro-cartilaginous growths. A tumour is formed in the shaft or head of the long bones, by the slow collection of fluid and the expansion of the parietes; this takes place very slowly, and, after many years, it may burst through the bony or membranous parietes, and come to the surface; a discharge of bloody serum, of glairy fluid, or ill-digested pus, takes place, but without subsidence of the swelling. In fact, cavities in bones of any size, particularly those in which the shell is so very thin, contract, if at all, very slowly. The want of elasticity or contractility in the tissue, with its low vital power, as formerly remarked, accounts for the slowness, difficulty, and impossibility, in many cases, of bringing about a cure of suppurating cavities in bones. Amputation of the member must be had recourse to in such cases as the one from which this



bone was obtained, in order to preserve life. The operation was proposed, and the poor lad, emaciated and worn to a per-

fect skeleton, by suffering and discharge, would willingly have submitted to it, and in all probability he would have been now alive, and a useful member of society. A cruel and hard-hearted female relation, on whom he was dependent, refused to permit a chance being given him, on the ground that he could not for a time support himself, and that he was better dead, than alive with the loss of one of his extremities.

Tumours occasionally form in the sheath of the nerves of the extremities. The sciatic and its branches are most frequently so affected. The anterior crural is sometimes involved, and more than one nerve may be affected in the same individual. The nervous fibrillæ are stretched and displaced, and the parts supplied are the seats of painful sensations and numbness. These tumours vary in structure; they consist of a cheesy or albuminous deposit in the neurilema, or they may be hard and fibrinous, or, again, their section presents a brain-like and bloody mixture, a strange distempered mass. I removed from a middle-aged and healthy-looking man, in the Edinburgh Royal Infirmary, a tumour which had occupied the popliteal space for a considerable period; it was growing rapidly, had attained the size of a cricket-ball, and impeded seriously the motions of the limb. On pursuing the dissection, the tibial nerve was found intimately connected with it, the fibrillæ stretched upon its sheath, entering into and mixed up with the substance of the growth; the nerve was cut above and below, and the whole mass extirpated unbroken and entire. A tumour was ascertained, during his stay in the hospital, to exist on the fore part of the same thigh; an inflammatory swelling took place here and suppurated, but after this was opened, the original lump remained. Within six months of the healing of the wound in the ham, the patient returned with an enormously swollen limb, and a large elastic morbid mass in the back part of it; a bleeding fungus was protruded, and he soon died. The original tumour, in my collection, is soft and bloody; the one from the fore part of the thigh, ovoid and larger than a hen's egg, involved the anterior crural nerve, and is fibrinous. The diseased structure, which was reproduced in the popliteal space, had all the characters of fungus hæmatodes; strange to say, the removal

of the tumour from the ham, with at least three inches of the tibial nerve, was not for an instant followed by the slightest deprivation of sensation or power of motion in the limb or foot. Amputation of the member has been resorted to when, during the dissection of a tumour, it has been found intimately connected with a large nerve; this step is unnecessary and unwarrantable. Tumours not of a malignant character have been taken away with part of the sacro-ischiatic nerve successfully.

Tumours over the ligament of the patella are by no means uncommon, and are attributable to pressure; they consist of a thickened state of the superficial bursa in this situation, with accumulation in its cavity. The degree of thickening, and the nature of the contents, are various; the quantity of fluid in cases of long standing is often very small; in fact, a sort of encysted tumour is converted, through deposit of lymph, which becomes organised by degrees, into a solid mass. The contents are at first thin, after bruise tinged with blood, sometimes cartilaginous bodies float in it. The recent cases are treated satisfactorily by hot fomentation and deobstruent plaster, though confirmed and old enlargements may require to be blistered, and in extreme cases a few silk threads may be drawn through the cyst. The mode of treating abscess in this situation has been adverted to in the first chapter. When the tumour has become solid or nearly so, and has resisted all attempts to promote discussion, then it may become necessary to dissect it out; the incision must be made in the direction of the limb, and no integument should be removed, if it can possibly be avoided.

A tumour, here represented, in the recent and macerated states,

gives rise to great trouble and annoyance. It is covered by thin and adherent integument, displaces the nail, and grows from the bone; the attachment is by a narrow neck as here, but it is often broad. It is met with in the working classes, in young people who have walked without shoes and thus been exposed to contusions of the part. The great toe is the common seat of these cellular exostoses, but it has been met with in the smaller ones. I have one specimen in which the growth is fully as large as the phalanx from which it springs. This tumour may sometimes be extirpated by incision of the soft parts, and the use of the cutting-pliers. The disease is apt to return. It may often be necessary to take away, along with the tumour, the bone to which it is attached: this proceeding will be treated of in the next Chapter.

CHAPTER X.

AMPUTATIONS.

The operation of amputation is not so frequently had recourse to now as heretofore, and the progress of surgical information will contribute to render it even more rare than at present. The occasional necessity for its performance is insisted upon in the Chapter on Diseases of Joints and elsewhere in this volume, but it is resorted to only in extreme cases as a means of saving life. The different steps of the process must be studied carefully, so that it may be performed dexterously, with the least possible pain or risk, and in such a manner as to restore the patient's comfort and power of exertion. The mode of forming a stump so as to cover the bone well, and protect the truncated extremities of the nerves, must be well thought of, and its length is also to be considered with reference to the contrivance which is to be substituted for the lost member. The propriety of providing against the profuse flow of blood, will naturally first engage the surgeon's attention. In the minor amputations this is easily effected by pressure, if need be, on the trunk leading to the part to be incised. In the greater amputations, the flow of blood into the limb may be effectually checked by exact compression with the hand on the principal vessel. Much less pressure is required to effect this object than is generally supposed; the assistant, however, must be perfectly cool and steady, and know well the course of the vessel. This mode of arresting hæmorrhage during opera-

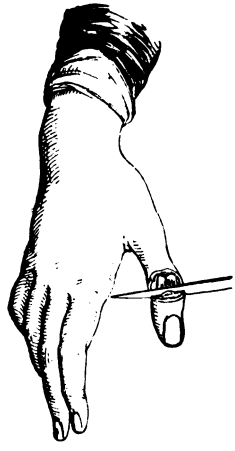
tions on the limbs, possesses considerable advantages. The pressure is not made until the instant the incisions are commenced, and then only on one point. The limb, therefore, is not gorged with blood, and the soft parts can be much more readily carried back from the bone, than when they are confined by a circular band. A strong spring with pads, one placed in the course of the vessel, and the other on the opposite point, may be used in cases where there is a scarcity of assistants, or when there is a probability of many vessels requiring ligature, and of its being therefore necessary to keep up the pressure for a considerable time. An assistant having the charge of the pad, will preserve its position, and regulate or apply additional pressure, without having his hands cramped and fatigued.

The screw tourniquet, if properly managed, may, under many circumstances, be very useful to practitioners of any standing. The head of a roller of proportionate size, is placed over the course of the vessel as a compress, while a part of its loose extremity is carried round the limb. The instrument is then buckled on and screwed up tightly and quickly, as soon as the surgeon is quite prepared to enter his knife, but not before. The flow of blood into the limb is thus instantly checked, and the veins are not subjected to over distension. It is inconceivable how much blood regurgitates, and also flows out from venous branches on the face of a stump, when compression is made in a slovenly and inefficient manner. So soon as the principal vessels are tied, one, two, or at most three, the tourniquet, which has been hitherto kept tight, is immediately thrown loose, and the bands and compress removed; on the same principle, pressure made in any other way is removed as soon as possible, so as to permit the return of blood, and prevent the confusion which arises from the veins pouring out their contents as copiously as the arteries. The ligature of veins, as sometimes practised, is in general unnecessary, and is supposed to be attended by considerable danger. By trusting then to a good and qualified assistant, who will make accurate pressure with his fingers by the spring, or to the tourniquet scientifically applied, a very small quantity of blood will be lost.

The position of the patient and assistants, the nature and arrangement of the apparatus, must next be considered. The kind of the disease or injury, for which the larger amputations are performed, and the state of the patient, will generally render it necessary to have him placed recumbent. In some of the operations on the upper extremity, the patient may be placed in a chair and supported by assistants. The surgeon should so place himself, in all these operations, that he can accomplish all the objects he has in view, and complete the proceeding without changing his position. He should be able to grasp the part that is to be removed with his left hand, so as to facilitate the disarticulation or sawing. The limb may be supported, and its position varied to a certain extent, by an assistant, but it must not be trusted entirely out of the hands of the surgeon himself. An assistant, if there be several, stands on each side of the patient; one secures the temporary suppression of the circulation, another is prepared to hold back the soft parts, a third and fourth hand the instruments and sponges to the operator, whilst another strives to sooth and reassure the patient, and administers cordials if they be necessary. Too much care cannot be bestowed in washing the sponges, removing gritty matter from their surface, and squeezing them dry. Upon such apparently trivial, but really serious duties on the part of the assistants, much of the comfort of the patient during the operation depends. But in many situations fewer hands must suffice. The bleeding is then arrested by a tourniquet, or some substitute for one, as a handkerchief and bit of wood, and the instruments must be disposed on a table, or chair, or on the ground, so that they be within the reach of the surgeon. Even in the midst of good and sufficient assistance, it is no bad plan for the surgeon, in any complicated and difficult operations, to arrange his apparatus in such a way that he can put his fingers on any instrument that he may want, instead of calling for it in the midst of his proceeding, with a chance of getting any but the right one handed to him. The knives must be suited to the extent of the incisions; it must be the object of the surgeon to complete these smoothly and quickly, and to make them of such form, that

their edges will fall readily into contact, and be retained without pressure or stretching of the neighbouring parts. Many amputations can be best performed by cutting from the centre to the surface of the limb, in others, part of the incisions may be made with advantage from without, and completed by cutting from within; others, again, may be performed very well, by cutting from the periphery towards the bone or joint. The incisions from within outwards, are more quickly performed, and give less pain than those in the opposite direction.

In the amputations of the fingers, the mode of proceeding may be conveniently varied. If the hand is presented prone, and the surgeon is called upon to remove the last phalanx, the first incision is made from the surface into the articulation, the hand being held firmly by the assistant. The operator holds the phalanx to be removed firmly betwixt his thumb and fore-finger placed on the dorsal and palmar aspects. He then places the point of his knife over the articulation, previously a little bent, and inclines the handle downwards. The first object being to open the joint and to separate it thoroughly by dividing the lateral ligaments, he runs the instrument quickly across, from point to heel, and at the same time raises the handle; the head of the bone is thus exposed, and is turned out by changing the position of the finger and thumb and holding the phalanx firmly by the sides. The blade of the knife is now carried behind it, and a flap formed from the soft parts on the front of the finger in a rounded shape. The proceeding is reversed when the hand is supine; the knife, a narrow, sharp-pointed bistoury, is run across the fore part of the articulation beneath the soft parts, the flat surface towards the bone, and a flap of the same shape and dimension as in the former case made, sufficiently long to cover the end of the middle phalanx. The exposed articulation is immediately opened, and the separation completed at

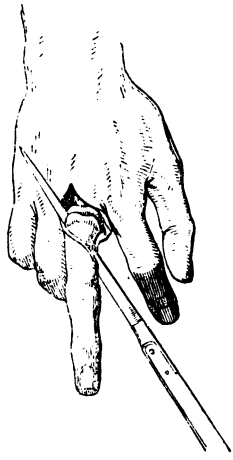


one stroke. It is seldom necessary to tie any vessel: but if bleeding should persist, in spite of cold cloths assiduously applied, the end of the vessel must be taken up and tied. After the oozing has entirely ceased, the flap is adjusted and retained by a narrow strip of isinglass-plaster.

The same proceedings are applicable to the articulation between the middle and proximal phalanges. These bones may be divided through their shaft, after being exposed by circular incision and retraction of the soft parts, or by the formation of two lateral or antero-posterior semilunar flaps. The division of the bone is effected with the saw or with cutting pliers, the soft parts being protected by a piece of split cloth. Disarticulation is generally to be preferred as affording a speedy and satisfactory cure, and being a much less painful and tedious operation. The dread once generally and strongly entertained of the slow adhesion of the soft parts, over a secreting surface, is now dissipated, and no surgeon thinks of scarifying or scraping off the cartilage.

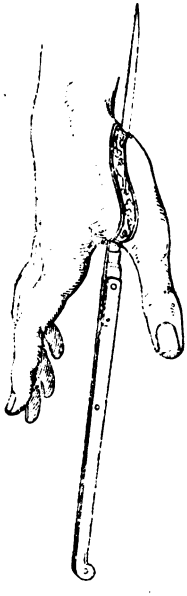
The separation of a finger from the metacarpal bone is not unfrequently required, on account of the destruction of tendons, articulation, and bones, the result of severe and neglected paronychia, for tumours of the bones, or soft parts, or in consequence of injury, as in compound fracture, luxation, and severe laceration. In some injuries of the hand, several primary amputations of the phalanges or metacarpal bones, or of the joints, may be required. The propriety of saving as much of any one injured finger as possible, and in severe injuries of the member, of avoiding by all possible means the removal of the whole hand, has been insisted upon in Chap. III. Even the little finger alone, is of more use than all the mechanical contrivances (many of them ingenious enough) which can be attached to a stump of the fore-arm. The removal of a finger at the metacarpal joint, may be effected in two ways. An incision is made on the radial or ulnar side of the joint, as may be, over the prominence of the knuckle and in a semilunar form, the convexity being forwards. The finger is inclined to the opposite side, and the point of the narrow bistoury entered into the

joint, the capsular, lateral ligaments, and extensor tendon are cut, and the head of the bone turned out; the blade of the knife is then place behind it, and the part removed by the formation of a similar and corresponding flap on the opposite side; or an incision is at once made of an oval form from the point above indicated, completely round the joint and terminating where it began; very similar flaps are thus formed; the tendons and ligaments are then cut and the part detached. One or both digital arteries will generally require ligature; the end of the incision on the dorsum of the hand may be put together by a point of suture or by plaster, and the oozing having ceased, the apposition and retention of the surfaces are effected sufficiently by tying the ends of the neighbouring fingers together with a bit of tape or bandage. The hand is now elevated, kept dry and uncovered; and if after a few days discharge should appear, the parts are made clean and the warm-water dressing applied.



The phalanges of the thumb are removed as those of the fingers; the metacarpal bone is separated from the trapezium by passing a narrow knife, longer than that used for the fingers, from the middle of the space betwixt the fore-finger and thumb, marked by the depression at the decussation of the adductor pollicis and abductor indicis, to the articulation; the knife is run from point to heel, and the handle inclined towards the fore-finger. It is arrested by the articulation, and if the edge be turned towards the ulnar side a little, and the thumb pressed in the opposite direction, the joint will be easily opened, and the head of the bone so loosened, that the blade of the knife can be passed behind it. A good fleshy and muscular flap, quite long and broad enough, can be formed by bringing the blade close along

the bone to beyond its distal extremity. A better mode consists in completing the incisions of the soft parts before attempting the disarticulation. If it becomes necessary to remove the right thumb, an incision is commenced over the dorsum of the metacarpal bone, about three fourths of an inch above the articulation; this is carried along the line of the bone, inclining but very slightly to its radial aspect, to the fold of integument betwixt the thumb and fore-finger; here the point of the long narrow bistoury is entered, and passing under the adductor muscle, it is made to emerge through the incision where it commenced. In order to effect this smoothly and dexterously, (if that adjective can here be applied,) the bistoury must first be held in the left hand, and after the puncture is made transferred to the right. The proceeding is exactly the same in the operation on the left thumb, but the incisions are here necessarily commenced with the right hand and finished with the left. It may be done otherwise, but great apparent awkwardness is avoided in this and other operations, by a surgeon who can use either hand readily. These amputations of the thumbs are generally demanded on account of injury or disease of the bones and joints, following acute inflammatory action, often the remote cause of injury, as puncture, or bruise, though perhaps slight, and not attended to at first.



I have had occasion to remove the little finger and its entire metacarpal bone in several inatances, on account of cellular exostosis of large size, attached by a broad base. In all these operations, care must be taken so to fashion the flaps, that they shall sufficiently cover the ends of the bones, without being either too long or too short. In removing parts of the hand for tumours or ulcers of a bad or suspicious nature, the first and main object

is to get thoroughly rid of the diseased parts, and it may happen in doing so, that soft parts cannot be saved in sufficient quantity to cover the exposed surface completely. I had occasion, very lately, in the case alluded to at p. 268, to remove the little finger and bone supporting it, at its articulation with the unciform bone, on account of tumour involving the proximal phalanx, the joint and terminal extremity of the metacarpal bone; the flap was of necessity left scanty, and the cure was protracted by eight or ten days in consequence; without encroaching on the morbid growth and risking its reproduction, any greater quantity of integument and muscle could not have been saved. The growth proved to be soft and dark-coloured, almost melanotic at some points. This dark appearance might perhaps in part be attributable to the punctures made at various times, for the purpose of exploration or of evacuating collections of fluid, supposed by some to have existed. Grooved needles and lancets had been, during the progress of the disease, passed into the substance of the swelling some eight or ten times, not with the effect, most certainly, of arresting its increase, or improving its disposition. It is to be feared that sufficient pains are not generally bestowed in ascertaining the history and duration of cases that present themselves, nor are means taken to acquire that necessary degree of tact, by which the nature and consistence of various swellings, may almost constantly and with certainty be predicted. In removing the little finger with its metacarpal bone, a sufficient flap can generally be made of integument, with the abductor and flexor brevis muscles. It is perhaps the best plan to make the flap in the first instance, by entering the knife on the dorsal or palmar aspect over the head of the bone, and drawing it down at once to a sufficient depth along its radial margin, to beyond the metacarpo-phalangeal joint: here it is turned, and the incision continued along the opposite aspect, and still to the radial side. The full fleshy flap thus formed, is rapidly dissected back, the point of the bistoury is pushed betwixt the bone to be removed, and the adjoining one, drawn at one sweep through the soft parts, and then, by turning the member outwards, the separation from the unciform bone is easily effected.

The necessity for removing the whole of one of the metacarpal bones of the fore, middle, or ring-fingers, seldom, if ever, arises; but cases do occasionally present, where the distal extremity of one of these bones being involved with the articulating apparatus in disease, it becomes proper to remove part of that bone along with the finger. Incisions similar to these for the removal of the finger at the first joint, by the oval method, are made to pass beyond the head of the bone; the flexor, and extensor tendons are divided, and by the application of a small narrow saw, without or with a back, (the bow-saw,) or by the use of cutting forceps, the bone is divided. In using the forceps, the flat side is applied towards the trunk, so that the divided surface left, may be perfectly smooth. It is astonishing how readily the bones can be so cut asunder, and without the least splintering. The approximation and retention of the adjoining fingers, with water dressing, completes the after treatment.

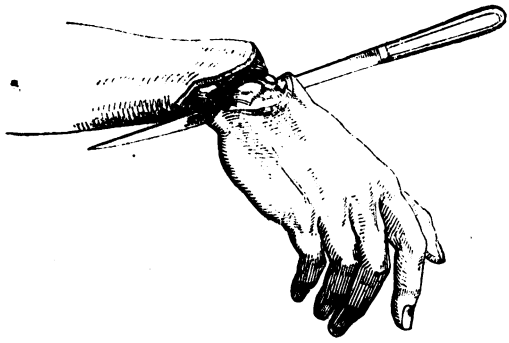
When the whole hand is involved in serious and incurable disease, which is uncommon, or when the metacarpal bones of the fingers and thumb are reduced to a confused pulp of lacerated soft parts and comminuted bones, as by entanglement in the cog-wheels of machinery, the surgeon must choose between amputating at the wrist-joint, or in the middle of the fore-arm. I have once only practised the operation at the joint on the living body, and left a very useful stump. The machine-makers say, that the extremity is thus left too long, when their apparatus is applied; this may look somewhat awkward, but it is an advantage to a working man to be able to make a long arm, and possess the full rotatory motion of the limb.

Since writing the above, I have had occasion to practise the operation a second time on a patient, who is at present in the North London Hospital, and now convalescent. His hand got entangled under a very heavy mill-stone, which revolves on its edge, and is used, it appears, for grinding drugs. The hand was crushed to atoms, and the articulation betwixt the two rows of carpal bones opened. The stone had run up along the fore-arm, and there was great bruising and separation of the integument,

with extensive and bloody effusion into the cellular tissue, halfway towards the shoulder in the upper-arm. There was some abrasion of the surface, but no opening into the collection. It was barely possible to save sufficient skin to cover the ends of the radius and ulna, and I preferred giving the patient the chance of a good and long stump to cutting in the midst of the bruised parts, and into a bag of blood. For a few days the appearance was promising, and a speedy absorption of the effused fluids was expected. But notwithstanding all precautions as regarded position, &c., pain and swelling supervened; and in order to prevent extensive destruction of the skin, several free incisions were required in the fore-arm, and even above the elbow. The stump is nearly healed, and the swelling of the limb has gone down. The dread that the cure will be retarded by the slow union of the integument over the synovial membrane and cartilaginous coverings of the bones, is groundless. It is a good rule in amputating, on account of injury, to make the incision wide of the bruised parts, in order to avoid the risk of an unhealthy stump. The rule was not so much departed from in this case as might be supposed. There was one comparatively uninjured point betwixt the lacerated parts and the bruise, and this was not unhappily chosen for the incisions, instead of the arm near the shoulder-joint.

The operation is most conveniently and readily performed, by making an incision of a semilunar form, with a small amputating knife, (those which I use for all amputations, as will be seen by reference to the illustrations, are straight-backed, thinned near the point, and slightly convex on the edge,) through the integument over the second range of carpal bones. This flap is pulled back, the joint opened, the lateral ligaments and tendons on the radial and ulnar sides divided, and a second, little longer and more full flap formed, in bringing the knife out in the palm.

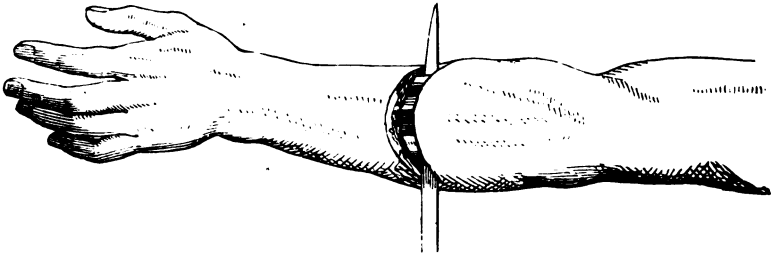
The radial, ulnar, and perhaps the interosseous arteries are tied, the parts brought together by one point of suture, at the apex of the flaps; cold cloths applied for some hours, and the edges then neatly approximated, and retained in close contact



by narrow slips of the proper plaster. A tourniquet can never be wanted in the operation on the upper extremity, unless no assistance whatever can be procured, and there is no occasion for bandage, compress, or pledget. These are certainly superfluous and hurtful, when the operation is well performed. The suture is removed on the first or second day; and if the wound should open at all, simple dressing can be applied, by which is meant not a compound of grease and filth, often enough rancid, with some drying earth, as it is called, but tepid water with lint, and oiled silk, followed in due time by some slightly astringent lotion, if such be required.

Amputation of the fore-arm should not be attempted below its middle, otherwise a good covering cannot be had for the ends of the bones. It is called for in consequence of severe injury, or disease of the wrist-joint. In amputating, in the former case, the limb should be grasped above the wrist, and extension made so as to put the muscles on the stretch, that they may be cut evenly. If this be not attended to, and one set is cut whilst somewhat stretched, the others being relaxed, a very uneven and ragged stump will be formed. The limb is placed in a middle state betwixt pronation and supination; the surgeon takes hold, with his left hand, of the lower part of the limb, whilst an assistant puts the integument on the stretch above: the posterior flap had better be made by cutting from without towards the bones, the horns of the semilunar incision being made to project well upon the palmar

aspect; transfixion is immediately made, and without raising the knife from the part, by passing the blade under the flexor muscles, close to the bones, from the termination to the point of commencement of the first flap. In operating upon the left arm, the first incision is commenced on the radial side, upon the right arm on the ulnar side. The flaps being completed and held back, the interosseous substance is divided, and the bones sawn together. In doing so there is no necessity for changing the position of the limb. The part to be removed is not heavy, and can easily be supported in the left hand of the surgeon; there is no risk of the bones snapping and splintering if ordinary care be taken. In using the saw, the part to be removed is very slightly depressed, so that the instrument may not be locked. If this be attended to, the saw in good order, the teeth sharp and well set, and used with a light hand, the division of the bones will be completed smoothly, quickly, and without jar. No retractor is required in this operation; the ligature of vessels, which will be found easily on the anterior flap, and the dressing, both primary and secondary, are the same as already described. The operation is here shown as about half completed.



In some cases of injury, involving great part of the fore-arm, amputation may with advantage be performed at the elbow-joint. The surgeon will be guided in his preference of this to the operation on the upper-arm, by the state of the soft parts on the anterior aspect of the joint, and the possibility of saving sound skin and muscle to cover the end of the bone. I have performed the operation more than once on the living body, and should be disposed to repeat it in favourable cases. One flap is formed by transfixion, the blade of the knife being made to pass under the

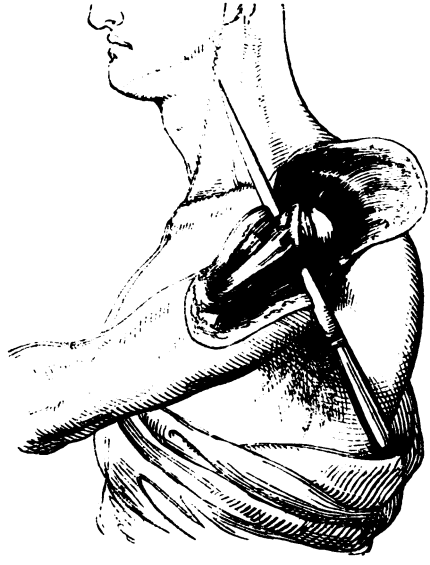
bellies of the supinators and flexors, close to the fore-part of the articulation, from the ulnar aspect on the right extremity, from the radial on the left; a fleshy semilunar flap is thus formed by cutting downwards and to the surface. Feeling for the outer condyle, in the one case with the fore-finger, in the other with the thumb, the knife is passed round behind circularly, and so as to penetrate the articulation, betwixt the head of the radius and humerus; the fore-part of the joint is opened, and the internal lateral ligament cut, the olecranon process may then be either sawn across or disarticulated, according to the choice of the surgeon.

The amputation of the upper-arm, when performed for disease of some standing, is perhaps as simple and easy of accomplishment as any in the whole range of surgical operations. An anterior and posterior flap is formed by transfixing the limb close to the bone; the object is to form both flaps as nearly of the same length and dimensions, in every way, as possible; the anterior is to be made first, and with this view; the point of the knife is entered on the inner or outer aspect; it is pushed down to the bone, turned round its front surface, and the transfixion completed, leaving the vessels and nerves on the posterior part. By cutting downwards, and to the surface at the same time, a round and neat flap is produced. The knife is then promptly entered on the other aspect of the bone through the same incision on each side, about an inch lower than the points of transfixion, and a similar and corresponding flap forthwith cut out. These are retracted powerfully by an assistant, the first flap having been merely raised until the other was completed; the knife is made to revolve round the bone, so as to cut the muscles pretty high, and clear a space for the application of the saw; the surgeon is so placed that he holds the bone during this process, the fore-arm being supported by an assistant; and to guard still further against accident, it is well to cut the bone by directing the instrument perpendicularly. The length of the stump will depend upon the state of the parts; it may be possible to saw the bone considerably below its middle, or again, the division of it may require to be made close to its neck. The

muscular covering, in the latter case, instead of being furnished by the triceps and biceps, consists principally of the deltoid coraco branchialis, &c.

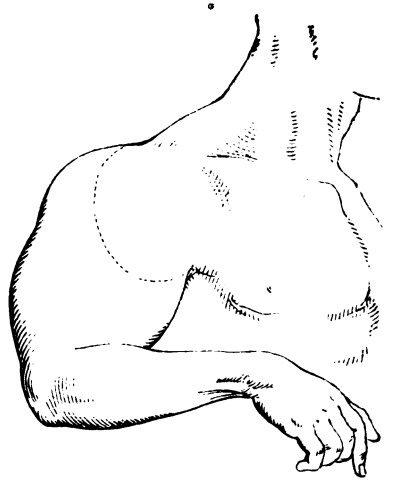
On account of extensive laceration, compound fracture, or tumour of the os humeri, it may be rendered indispensable to remove the extremity at the shoulder-joint. This operation will require to be varied according to the nature of the particular case. The covering for the exposed part of the scapula may be obtained from the sides, from one or both, or from the external aspect. It may be formed of the deltoid in a great measure, and in one mass, or it may consist of muscular substance, of part of this muscle and of the pectoralis and latissimus dorsi, proportioned, as may best suit the circumstances. Occasionally, as I have found in several cases, very little covering can be obtained. The incisions may be made by transfixing and cutting both flaps from within outwards; or one flap may be made by cutting from the surface upon the joint, the disarticulation is effected, and the incision of the remaining soft parts completed from within. In performing this operation for injury, or for disease which does not encroach greatly on the joint, where the surgeon has his choice as to the form of the incisions and flaps, he cannot do better than make two of nearly equal size, and form his posterior one first. The patient is most conveniently placed in a chair, he is supported by a sheet or jack-towel, passed under the scapula and held by a steady assistant; the surgeon assisting compresses the artery as it crosses the first rib, by pressure in the space above the clavicle with his thumb, a boot-hook or key, wrapped round with a piece of roller or wash-leather; an assistant is ready to hold back the flaps and assist in the arrest of hæmorrhage, by the position of his hands and the application of ligatures. For this amputation, a knife of a good and sufficient length is used: the one represented is rather short for the purpose. On the right extremity it is passed from the anterior margin of the deltoid, about an inch below the acromion process, across the outer aspect of the capsular ligament, until its point appears within the posterior border of the axilla; by drawing

the instrument towards him, the operator makes quickly a full and rounded flap. The origins of the triceps and biceps, the insertion of the infra and supra spinatus, are then cut through, and the joint fully exposed and opened at one sweep; the arm is carried across the chest, the blade of the knife passed behind the head of the bone, as shown below, and carried close to it; an assistant follows the back of the instrument with his fingers, and grasps the soft parts, while the inner flap is being safely completed. The first flap is made on the left shoulder, by reversing the direction of the knife in the transfixion; the point is introduced within the posterior border of the axilla, and brought out at the anterior margin of the deltoid; the rest of the proceeding is essentially the same as in the former case. The limb being removed, the axillary, with its



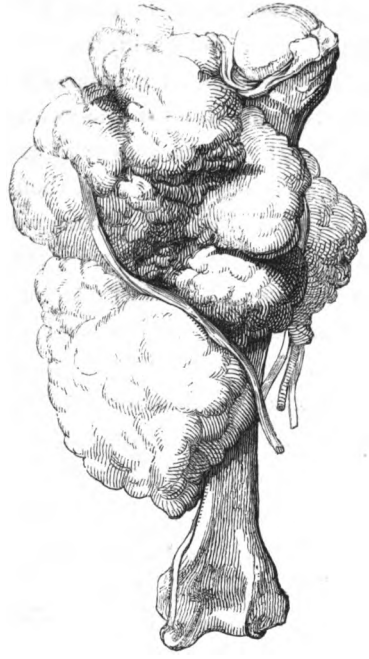
bleeding branches, are secured; after this and similar operations, two or three pairs of the spring-forceps will be found most useful. The wound is lightly dressed at the proper time.

It will be found more convenient in such a case as the one represented on the next page, to make the first incision from the surface. In fact, the formation of a flap by transfixion would have been absolutely impracticable. The disease, bony and cartilagi-



nous tumour of large size, twenty-two inches in circumference, had been in progress for many years, nearly forty, and had encroached upon the joint, so as to impede its motions, and latterly to cause dreadful suffering by its pressure upon the nerves, and upon the parietes of the chest. The patient, himself a surgeon, was at length, from continued suffering and want of rest, driven to submit to its removal. I was very ably and kindly assisted by Sir Richard Dobson, the surgeon-in-chief of Greenwich Hospital, by Mr. Quain, Dr. Domville, and Mr. Busk. The outer flap was made by drawing the knife from the margin of the latissimus dorsi to below the fore part of the acromion, and down to the joint; the immense tumour was turned out by a stroke or two of the knife, and an anterior flap, as shown by the dotted line, so formed; the vessel, admirably commanded by Sir Richard, was compressed still further by an assistant, as recommended above; after it was tied, a mass of glands, which had adhered to the apex of the tumour, was dissected out from the sheath of the vessels, and from amongst the nerves; six or seven branches were tied; the patient, who bore the proceeding with the utmost fortitude and without a murmur, was then removed to a couch, and the wound brought together in an even line, without the least strain, by a few points of suture. Considering the displacement of surround-

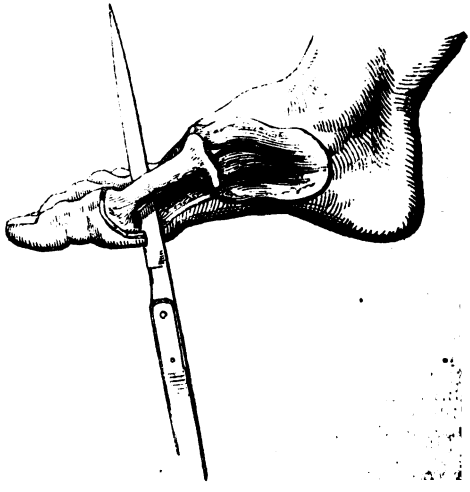
ing parts by the diseased mass, shown here with the nerves stretched over it, it was fortunate that so just a proportioning of the flaps should have been observed.



The phalanges of the toes are removed, when necessary, by the same proceeding as is recommended in treating of the similar joints of the upper extremity; it is to be recollected, however, that the metatarso-phalangeal articulation of the small toes is deeply situated in the ball of the foot, and the incision, in making the flaps, must reach this before the point of the knife is used to divide the capsule, ligaments, and tendons; it is with the point and not the blade of the bistoury, that this is to be effected, otherwise the integument will be cut across, and notched in a very awkward manner. The cases in which it may be deemed proper to remove part of the toes are, injury, intractable disease commencing in the soft parts, onychia, of a bad kind, involving the matrix of the nail and phalanx, disease of the joints, and bony tumour.

Disease is often situated in the articulation of the proximal

phalanx, more especially of the great toe, which is not to be wondered at, considering its exposed situation, and its liability, from the immense strain and weight thrown upon it, to be wrenched and twisted; on that account it is often necessary to remove part of the metatarsal bone along with the toe. In many cases the bone is thoroughly diseased, it is hollowed by abscess, sometimes commencing originally in its substance, and it is often partially necrosed. The articulation betwixt it and the internal cuneiform bone is also occasionally involved, though this is a rare occurrence. The removal of the whole bone with the toe is often demanded, and I have had occasion more than once to remove also the internal cuneiform. The most effectual, quick, and least painful mode of getting at the bone to cut it across, or of exposing the articulations, in order to divide their attachments, is to form a flap similar to that recommended for the removal of the little finger. If the disease be confined to the distal end of the metatarsal bone, the incision should commence or terminate, (according to the position of the surgeon, the foot he has to treat, and the facility he may possess of using equally the one or other hand,) on the dorsum of the foot, over the proximal end of the bone, and rather to its fibular aspect; if so commenced, a sufficiently ample and long flap is formed by turning the knife round,



beyond the diseased joint, into the plantar aspect, and extending the incision to the point opposite to where it commenced. The flap, which may include, and be perforated by, several openings, is reverted by a stroke or two of the bistoury, which should be stronger than usual, pretty long, and broad; the instrument is passed betwixt the toes, and made to cut outwards; all the soft parts are divided, and the bone is forthwith sawn or clipped across about its middle, or towards its head, if the disease should be extensive, as in the annexed sketch. Here is an

ulcerated cavity of long standing in the situation of the joint, which is anchylosed, and contains a sequestrum of the cancellated texture. The shaft of the bone was cut across with the forceps, and its head left. From some cause, troublesome secondary hæmorrhage occurred from the anterior tibial, and several days after the removal of the toe, it was found necessary to raise the flap, and turn out the remaining portion in order to reach the vessel; the head of the bone, with its smooth section, was thus obtained.

It is a great object to save the head of the bone, as it gives attachment to one powerful muscle, partly to another; but this is very often impossible, and notwithstanding its removal the foot becomes soon strong and serviceable, the tendons forming new and firm connexions. If the removal of the whole bone is determined upon, the flap, of the same form, should be detached further towards its base, the toe is pushed forcibly to the tibial side, and the ligaments divided, if the nature of the disease will admit of it, for the bone is sometimes so acted upon by the absorbents that it will scarcely bear handling. The bleeding is stayed during the operation by pressure on the anterior tibial, as it lies exposed on the dorsum of the foot; its cut end is tied, the flap is put in its place, and held by a point or two of suture, cold water applied, and the edges put into contact in due time. In the

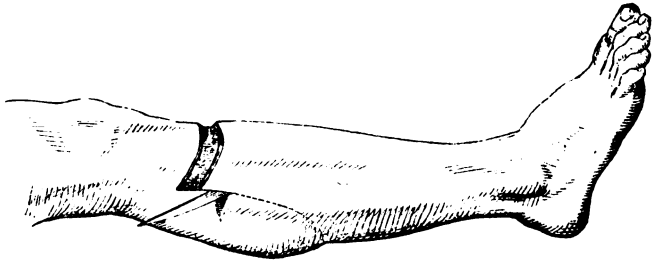
greater number of cases partial union can only be looked for, and discharge must continue for some considerable time.

Some of the smaller toes, and even all of them, may be taken away along with the bones supporting them, leaving only the great toe, and the most powerful part of the arch of the foot. The incisions must be fashioned according to the nature and extent of the injury or disease for which the operation is undertaken, the form and site of the articulations being attended to.

Circumstances sometimes arise to render the removal of all the toes, with their metatarsal bones, advisable. An incision is generally made across the dorsum of the foot, from the tarsal end of the metatarsal bone of the great toe to that supporting the little one, or the reverse; the disarticulation is effected, and the knife being placed behind the heads of the bones, a flap of sufficient length is procured from the sole of the foot; but the formation of this flap in the first instance renders the disarticulation more easy, and simplifies the whole operative proceeding. A large bistoury is preferable to the catline or small amputating knife generally used. A rounded flap is readily made by cutting from the tibial to the fibular side, or *vice versâ*, close to the roots of the toes; it is turned back, the two points, the commencement and termination of the first cut, are united by another incision carried across the dorsum in a semicircular form, and somewhat beyond the articulations to be opened; the integument is pulled back, the cellular connexions being cut, so as to permit of full retraction; the disarticulation is then completed with facility, the bones being forcibly bent towards the plantar aspect, more especially during the division of the ligaments binding the second metatarsal bone. The saw has been applied, as by Mr. Hey, to divide this and the other bones, but the disarticulation is very easily effected as recommended, and the surface is sufficiently even, and well disposed to heal. A shorter stump may be formed in this situation if need be, and in a similar way; the separation being effected betwixt the connexions of the navicular and cuboid with the astragalus and os calcis respectively; the vessels are tied, and the wound managed in the usual way.

The amputation of the leg is performed at one of two points, according to the circumstances of the patient, the bones being sawn either about mid-way betwixt the knee and ankle, or close to their upper ends. If the patient have not any laborious employment to follow, wishes to conceal the deficiency, and can afford to purchase an artificial foot, then the stump should be left sufficiently long for its attachment, so that the motions of the knee may be preserved, and the gait rendered less awkward. If, again, the patient is otherwise situated, the shorter the stump, the better and more serviceable it will be. There can be no greater mistake than to leave a working man with a long stump below the knee; it is continually in the way, and I have very often indeed been induced to comply with the request of patients to have their stumps shortened, and made of a more convenient length. Unfortunately, other reasons besides the mere length can be frequently urged to induce the surgeon to comply. The soft parts and bones have not been well proportioned, the cicatrix, if completed, is tender and liable to ulceration, the ends of the nerves, naturally bulbous where truncated, are exposed, and entangled in the scar, or with the end of the bone, and the patient is thereby kept in a constant state of agony; this must be the case very often, so long as the old, round-about, tedious, painful, and imperfect operation continues to be practised; not but that, in some situations, a good operator can make a very fair and good stump by the circular method, but it is, generally speaking, attended with much more suffering, and the results are not by any means so satisfactory. A surgeon must take great pains, and deserves infinite credit, if he makes anything of a tolerable stump, more especially where there are two bones, by any other than the mode by flaps; he may cover the bones certainly, but only by integument, separated by a painful process from its connexions, and slow therefore in contracting new ones. Under some circumstances it may be impossible, or inadvisable, to save muscle. It may be unsound, lacerated, or overmuch developed. The ends of the bones are not, when sawn high, exposed to pressure, and then there is less occasion for a muscular cushion. A sort of anterior flap should be made below the knee, but it is short

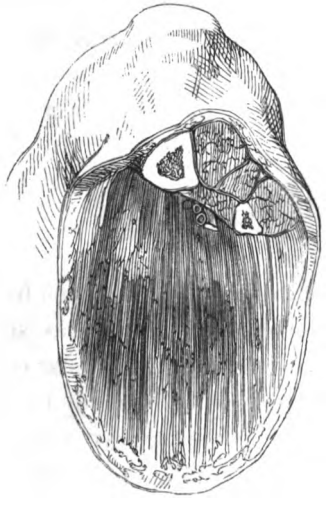
and thin, the principal covering is obtained from behind, and the incisions must be so contrived, that the edges and surfaces shall correspond. A proper fleshy cushion cannot be got lower than the middle of the leg; if the bones are to be sawn there, the surgeon will place himself so as to hold the limb with his left hand, below the part at which the division is to be effected; provision is made for the suppression of bleeding, and the sound limb is fixed with a handkerchief to the foot of the table; an assistant supports the affected foot, another puts the integument above on the stretch, and is ready to hold back the parts during and after the incisions are completed. If the right limb is the subject of operation, the point of the knife is entered on the outside, behind the fibula, it is drawn upwards along the posterior border of that bone, and to the depth of it, with a gentle sawing motion, for about a couple of inches; the direction of the incision is now changed, the knife being drawn across the fore part of the limb, in a gently curved direction, the convexity pointing towards the foot; this incision terminates on the inner side of the limb, and from this point the knife is pushed behind the bones, and made to emerge near the top of the first incision; the flap is then completed, as here shewn by the dotted line. All this is done



smoothly and continuously, without once raising the knife from the limb. The inter-osseous, muscular, and ligamentous substance is cut, the anterior flap drawn back, and its cellular connexions slightly divided; both are held out of the way by the hands of the assistant, and the separation completed with the saw. By proceeding thus all risk of entangling the knife with the bones, or betwixt them, is avoided. In dealing with the left limb the proceeding is very similar: the internal incision is not

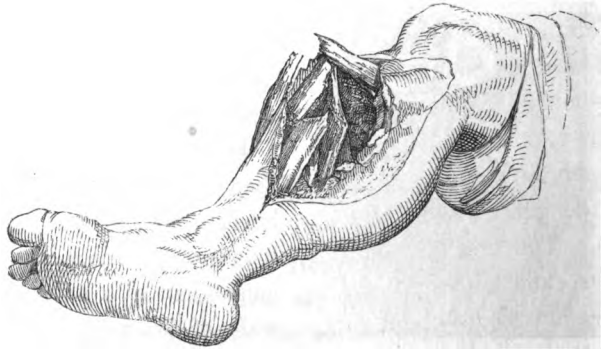
made quite so long; but it should still be practised; for a longitudinal opening of about an inch or more is more easily hit in the transfixion, than the mere point at which the anterior incision is commenced. In sawing the bones of the left leg, the tibia may safely be cut first, as the surgeon commands the limb during the process, and can easily obviate the risk of snapping the fibula. The awkwardness attendant upon a change of position is thus avoided. Disarticulation of the fibula is not advisable, owing to the vicinity or connexion of the head of this bone with the bursæ and knee-joint. It is seldom necessary to round off the spine of the tibia.

The amputation close to the joint is performed precisely in the same manner; the incisions being made so that the fibula is exposed and sawn immediately below its head, the tibia close to the tuberosity. One great advantage attending this amputation is the shortness of the stump; the patient resting on the knee, can cover his wooden support and stump with his trowsers. Another immediate advantage is the facility and rapidity with which the whole proceeding can be executed. In very many cases, I have managed so as to tie one vessel only, the popliteal, and this shortens materially perhaps the most painful part of the whole process. The form of the flap, and the relative position of the popliteal artery with its accompanying vein and nerve in the high amputation, is shown in the annexed sketch.

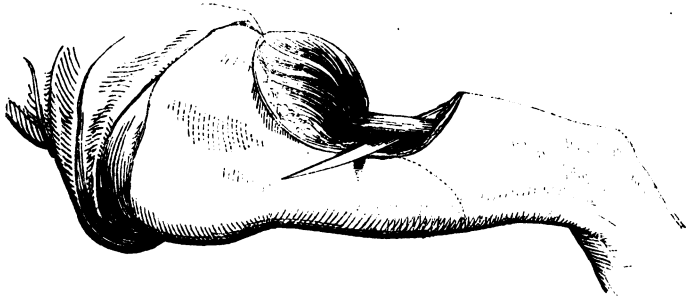


In amputation of the thigh, the bone should not be sawn lower than its middle, for a long stump here is equally inconvenient to a person in any walk of life, as is a long stump below the knee to an active working-man. A box sufficient

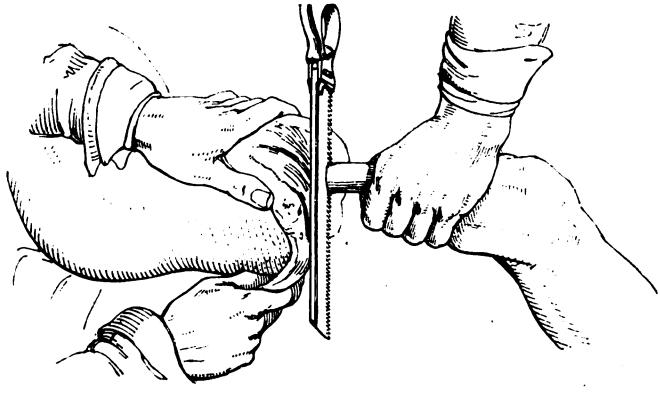
to receive the stump cannot be made when it is long; and when an artificial limb is desired, the knee-joint must be placed lower than natural, or the substitute made longer than the original. In amputating near the joint, in the commencement of my surgical career, not attending to the circumstances above stated, (and there is no mention made, nor is the disadvantage pointed out, in any book with which I am acquainted,) I was in the habit of performing Vermale's operation by lateral flaps. In the amputation at the point of election, or higher, it will be found better, in all respects, to follow the operation, which I introduced many years ago, by anterior and posterior flaps; and I believe I may lay claim to the credit, if any, of introducing more generally the mode of amputating, in all situations, by flaps formed principally by transfixion of the members. By the formation of the flaps from the flexor and extensor muscles of the thigh, a better covering can be made, in whatever position the limb is placed afterwards, (generally, it is bent on the pelvis, and perseveringly kept there, more especially in children, some of the antagonists to the psoas and iliacus being incapacitated from acting,) and the end of the bone remains more deeply imbedded; whereas, if the flaps are here made laterally, the end of the bone is very apt to appear at the upper angle of the incision. It being determined, for violent injury, as bad compound fracture of the leg, such as that



here represented—one of those dreadful lacerations brought from the Great Northern Railway to the Hospital,) for compound luxation of the knee with laceration, incurable disease of the joint or bones, or tumour involving these, to amputate the thigh in its middle, the necessary preparations are made. A table of convenient height is covered with folded blankets, or a thin mattrass: in private practice, the patient, if suffering much from motion, may be merely turned round in bed sufficiently to make the limb project over the edge of it. The assistant is placed to compress the vessel, or a tourniquet is in readiness properly strapped; the sound limb is held out of the way, or, what is better in all the amputations of the lower extremity, it is secured by a towel or handkerchief to the foot of the table. A dresser or pupil supports the limb to be removed, and others are ready to hand instruments, sponges, ligatures, or whatever may be wanted. The instruments should be previously laid out on a tray and covered with a cloth. They consist of a long, narrow, blunt-backed, and sharp-pointed knife, a plain, good, and serviceable saw, a pair of dissecting forceps, and a pair or two with a catch; to which may be added, a pair of bone-nippers, in case there should be any splintering of the bone; but it is the surgeon's fault if this happen. The surgeon places himself on the tibial side of the right limb, on the fibular side of the left, and, every thing being ready, he lays hold of the soft parts on the anterior aspect of the bone, lifts them from it, enters the point of his knife behind the vena saphena, in operating on the right side, passes it hori-



zontally through to the bone, carries it closely over its fore part, and brings out the point on the outward side of the limb, as low as possible: then, by a gentle and quick motion of the blade, completes a rounded anterior flap. The instrument is again entered on the inner side, a little below the top of the first incision, passed behind the bone, brought out at the wound on the outside, and directed so as to make a posterior flap, a very little longer than the former. The anterior flap is merely lifted up after it is formed; but now that both are made, they are drawn well back, whilst the surgeon sweeps the knife round the bone, so as to divide smoothly the muscles by which it is immediately invested. The bone, grasped by the left hand, is sawn close to the soft parts, the saw being directed perpen-



dicularly. The femoral will be found on the posterior flap, where it, with the other vessels, must be tied, and the stump treated as recommended after the other amputations. The proceeding is, in all respects, the same on the left limb, only that the incisions are commenced from the outer side. After the lapse of eight or ten days, or sometimes earlier, a roller should be applied and made to embrace the whole face of the stump, in order to cause the reduction of any swelling that may remain, and bring it into a good form. This is the first interference with the part after the operation, and is unattended with pain. It is very different from the practice of pulling off the loads of dressing, soaking and sponging away the effused discharges, and

reapplying bandages and pledgits, amidst the groans of the patient, caused by suffering much greater than that of the operation itself. By pursuing the light and easy mode of dressing, the fever and discharge are but trifling and the period of recovery is very considerably abridged.

By forming flaps from the anterior and posterior aspect of the limb, the bone may be exposed and sawn at the inner trochanter, or it may be removed at the joint. In making the incisions thus high, the common femoral must be compressed, as it passes over the brim of the pelvis, and an assistant must follow the knife with his hand and grasp firmly the anterior flap, whilst others are ready to compress the vessels in the posterior one, so soon as the sawing or disarticulation are completed. These operations must be set about with determination and completed rapidly, in order that dangerous effusion of blood may be prevented; they are not to be undertaken without great consideration and under very pressing circumstances.

One other mutilation, sometimes rendered absolutely necessary on account of intractable and malignant disease, remains to be considered: this is the removal of the male organ. It must be done in sound parts and at as early a stage as possible, before the lymphatic system is contaminated. There is no necessity for saving integument; on the contrary, it is an object to take away a good portion, as, during the cicatrization, by being drawn over the surface, the cut end of the urethra is apt to be obstructed by it. The part to be removed is covered with a piece of lint, laid hold of with one hand, and the body of the organ, put upon the stretch, is then severed by one stroke of a long knife; by making an incision on each side of the member, the urethra may be first cut a little longer than the corpora cavernosa. Three or four vessels by the side of the septum and on the dorsum may require ligature; simple dressings with cold and then tepid water are applied.

A second amputation of the upper or lower extremities may sometimes be demanded, on account of the inconvenient length or tender state of the first made stump, and on account of the

state of the bone or soft parts. The extremity of the bone, when well covered, is rounded off and diminished in size; but if exposed it becomes swollen, through inflammatory action. It may be uncovered, and present, in a foul sore, portions in the process of exfoliation; or it is often covered with integument only, or by a thin pellicle of cicatrix, which, by exposure to friction and pressure, is frequently brought into a tender and ulcerated state. Or, again, the nerves, which are rounded off and somewhat tuberous, contract adhesions with the end of the bone or the cicatrix; and thus exposed to external impressions and injuries, they become inevitably diseased. The irritability consequent upon this neuralgic affection undermines the constitution, and is felt seriously in other parts of the system. In a great many of these very bad and troublesome stumps a regular amputation is not necessary; the due proportion betwixt the bone and soft parts has not been observed, and but a very small portion of the latter need be taken away; in fact, only the thin covering on the apex of the cone. Two or three inches of the femur or humerus may be removed by merely making an incision on the aspect opposite to the vessels, down at once to the bone; and, by cutting close round it, the soft parts are drawn to the inner side, and the saw applied. The vessels are small, the principal is not interfered with; but, if it were, it would be found contracted and almost impervious to a considerable extent. The bone is now well protected, and the nerves are no longer pressed against it; if the patient has suffered much from neuralgia, it may be prudent to shorten the nerves at the same time with the bone. When there are two bones, and where the stump is very much too long, flaps are required to be made, and the bones, being then sawn, are left well concealed in the soft parts; in fact, the proceeding must be modified according to circumstances. I have had occasion to operate on some dozens of bad stumps, and, as already hinted, the necessity for doing so will constantly arise, until more care is taken in performing this very easy operation, as it is considered, and until a better system is in general use; (there is no difficulty in

removing a limb, certainly, but to do it well requires considerable dexterity and careful attention to the various steps of the proceeding;) even in following a good plan, mistakes may occur, through carelessness or inattention, and bad enough stumps have even resulted from the flap method.

Secondary hæmorrhage will sometimes follow when reaction has been established; the smaller vessels, owing to the patient being in a fainting state, not showing themselves at first. If the patient is very sick and low, and it is supposed that several vessels which may furnish blood afterwards are not secured, it may be well to have him laid in the recumbent position, carried to bed and watched, the wound being left open. When the mode of dressing before recommended is pursued, the patient is put to no trouble or pain in exposing the surface. Should bleeding by chance supervene in a few hours after the operation —and this is by no means so common or so much to be dreaded as when bandages are applied, tourniquets, put on slack, and so on—by which the part is heated and the venous circulation interfered with, the wet lint is merely removed, and the points of suture, if any have been made, cut; the coagulum is then taken out, and the bleeding vessels at once seen and secured.

Bleeding sometimes occurs at a later period, some six, eight, or ten days after the operation. This seems often to depend upon a sloughy and unhealthy state of the wound. The bleeding may be slight and possibly arrested by removal of the clot, dry dressing, support and position; but, if profuse and repeated, means must be taken to arrest it permanently and effectually. For this purpose, the circulation into the part must be weakened by ligature of the trunk, giving off the branches which are implicated: the proceeding is generally effectual. It may, however, be proper, for a time, to give uniform support to the wound, and to elevate the part.

I have had occasion to pursue the practice here recommended for secondary hæmorrhage in a considerable number of cases in hospital practice. During one unhealthy season, I was under the necessity of tying the femoral four times, on this account, in

the Royal Infirmary of Edinburgh, and assisted my colleague in securing the vessel, in a fifth case; the amputations had been performed below the knee, the bleeding was completely arrested, and all the stumps became healthy and did well.

CHAPTER XI.

INJURIES, LODGEMENT OF FOREIGN BODIES, AND DISEASES OF MUCOUS CANALS.

The extremities of mucous canals suffer occasionally from the forcible introduction of foreign bodies; these may be sharp and irregular on their surface, or disproportioned in size to the passage. The cause of the mischief may be immediately abstracted, or the substance may lodge, may interfere with the functions of the organ, and by its presence, cause great pain and uneasiness; by continued irritation, violent inflammatory action may be excited, terminating, perhaps, in the disorganization of the tissues, or of the organ which they invest. It must always be the object of the surgeon, to ascertain immediately and correctly, whether or not, and where, any foreign body is retained, whenever, by the circumstances detailed, or by signs or symptoms, he is led to suspect that such may possibly be the case. The effects, it is plain, cannot well be controlled, nor are they likely to subside, so long as the cause remains in operation. The practitioner must, therefore, be prepared to adopt means suited to each case, and calculated to avert or subdue the consequence of the lesion.

The wounds of the conjunctiva and of the surface of the eye are more or less serious according to their extent and depth. If the tissues have not been penetrated very deeply, nor the chambers implicated, if no foreign substance is impacted in the solu-

tion of continuity, then general antiphlogistic measures only are necessary; to prevent vascular excitement, cold spring-water, iced or not, must be assiduously applied. If inflammation has set in before proper treatment is adopted, or if it should have arisen in spite of it, the abstraction of blood, generally and locally, mnst be resorted to, and repeated to an extent proportioned to the importance of the part and the danger of disorganization. The cold applications must give place to those of a higher temperature, as being more soothing and agreeable to the patient, and as exciting a more beneficial influence on the local action. Penetrating wounds of the anterior chamber are not necessarily followed by loss of vision; those near the margin of the cornea, are closed by the projection of the iris, and the pupil may, after all, be little changed in form or situation. Wounds of the centre of the cornea of considerable size, those of the sclerotic, all those which are attended with breaking up of the internal structure of the organ, and the disturbance and evacuation of the contents of the bulb, are necessarily dangerous or fatal to vision. In these cases, means must, of course, be taken to keep down, moderate, and subdue inflammatory action. Foreign bodies may lodge on the surface, may be entangled in the superficial tissues, may have found their way into the cellular and fatty matter which surrounds the eye-ball, or even into the chambers of the bulb itself. The presence of those on the exterior, may be guessed at by the patient, or suspected by the surgeon, from continued irritation, pain on moving the bulb or lids, and lachrymation, coming on suddenly after the exposure to a cloud of dust or otherwise. By desiring the patient to keep the eye still, all foreign matter may be washed away shortly into the inner canthus, and there easily removed; or some may be detained, or it may be of such consistence and nature, very sharp particles of flint or metal, irritative or escharotic powder, as snuff or caustic, as to demand instant removal. By opening the lids fully in a good light, everting the upper one and turning over its cartilaginous border, the whole of the surface of the conjunctiva is brought into view; it is betwixt the bulb and upper lid that small foreign bodies most frequently

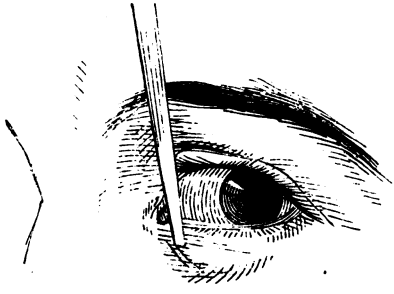
lodge, so that every particle can be seen and certainly got rid of. There is no difficulty in effecting the exposure of the inner surface of the lids, by the use of a probe pressed upon the upper edge of the cartilage, whilst the lid is pulled downwards by the ciliæ. But, by practice, this may be effected merely by the dexterous application of the points of the fingers of both, or even of one hand. A hair-pencil, corner of a handkerchief, the flat end of a probe, in fact, any small instrument, may be used for removing gently the foreign matter. A glass may be useful in detecting some minute and transparent bodies, and sometimes a pointed instrument may be required to disengage them. This is the case when pieces of metal are lodged in the cornea, from whence it is sometimes a troublesome matter to extricate them. It is necessary to do so early, from all situations, in order to avert or cut short inflammatory action, or to prevent the ulcerative process which will otherwise be set up in the tissues, in order to loosen and throw out the foreign substance, and which must be followed by permanent opacity. In operating thus upon the cornea, when difficulty is presented, the surgeon will find it necessary to fix the bulb firmly by the proper position of the points of the fore and middle-fingers of one hand; if not expert, the aid of an assistant may be called in, or a speculum resorted to. By incision of the cornea, foreign substances, as a bit of copper cap, may sometimes be removed from the anterior chamber, but the loss of vision is generally the effect, immediate or secondary, of such injuries. Large pieces of wood, of metal, pieces of dead bone, may sometimes be extracted from the orbit by careful incision, and without permanent injury to the organ of vision.

The body and cartilaginous parietes of the nostril may be shaken and displaced, and the mucous membrane disturbed and torn by violence from without, by blows on the prominent part of the organ, or by forcible introduction of foreign bodies into the cavities. The coarse handling of the parts in attempts to remove polypi, has been reprobated in a former chapter. The consequences of injury, inflammation, abscess, and troublesome ulceration, and deformity, are to be dreaded. Displacements must be

remedied, foreign bodies removed, inflammatory action kept under, and matter speedily evacuated, if it has been permitted to form under the pituitary membrane, in order to insure a speedy and satisfactory termination to the case. Many of the deformities consequent upon the destruction of the cartilaginous or bony septum, or of the columna, with sinking of the organ, are traceable to neglected inflammation and abscess following injury. The free passage of air is occasionally prevented by the chronic swelling and congestion of the vessels on the Schneiderian membrane, attended by increased discharge; and this may be the result or not of an acute inflammatory attack. The nature of the case must not be mistaken; it may be remedied by emptying the vessels by scarification, or by the occasional application of two or three leeches to the membrane, and by slightly astringent and stimulant lotions, powders, or ointments. Foreign substances are often lodged deeply in the nasal fossæ of children, more especially in the fissure betwixt the anterior and posterior cavities, such as seeds, kernels of fruit, glass beads, &c., and they, often enough, are impacted more firmly by the awkward and ill-directed efforts to remove them by forceps. The membrane swells and becomes soon tender. The foreign body may absorb moisture and increase in size, and the difficulty of getting rid of it is thus much increased. At any period, by placing a small bent scoop or curette behind the substance, it can be readily enough dislodged; it may slip into the throat, but generally it can be made to appear at the anterior opening. The patient must be firmly secured and a good light chosen; his struggles and screams are disregarded, for the object must be accomplished in the first instance, and the extraction can then be effected without much pain or trouble. The difficulties are all increased by delay and repeated futile attempts.

The obstruction of the nasal duct from affections of its mucous lining, or of its fibrous or bony parieties, is productive of great annoyance, distension of the sac, discharge of its contents into the inner canthus, and on the cheek, weakness of the eyes and lachrymation. This epiphora may be followed after a time

by excited action of the lining membrane, by greater distension, inflammation of the coverings, and abscess in the corner of the eye. This, again, is succeeded by a lachrymal fistula. In the first state of matters, the patient obtains relief by emptying the sac from time to time by gentle pressure; gently astringent applications to the conjunctiva, and which are taken into the sac, afford relief. The ductus ad nasum, moreover, may be opened by the gentle and careful introduction of a probe, properly bent, from beneath the inferior spongy bone. Dexterity in this operation, as in many others, must be acquired by examination of the construction and course of the canal, and by repeated trials on the dead body. If the periosteum of the passage is affected, abstraction of blood by leeches within the ala will afford relief, as also in the acute affection of the mucous lining, whether proceeding from below or above. In the more permanent abstraction, attended by abscess or fistula, the canal must be re-established by the introduction of instruments from above. An opening is effected through the coverings and sac into the nasal duct, by the insertion of a narrow knife thus, at once, and without pre-



liminary scratchings or incisions of the surface, care being taken that the point of the instrument passes in the right direction, from behind the nasal process of the superior maxillary bone, downwards and backwards; a probe or style is slid along the blade as it is withdrawn. The sign of its having reached the nostril being the discharge of blood from the cavity, and afterwards the forcing of air, with mucus, upwards, through the

puncture. Difficulty is sometimes experienced when the bones are uncovered and necrosed; errors are occasionally committed even when these are sound, the instruments being passed too much backwards, and forced through the thin lachrymal bone, certainly into the cavity of the nostril, but below the superior spongy bone, instead of the inferior. A bistoury, with a groove on its posterior and lateral aspect, or a sharp-pointed director, have been used to conduct the style; but the operation can be well enough managed without such assistance. The nail-headed style must be sufficiently long to rest in the nasal fossa; it is removed, cleaned, and replaced from time to time. After a short period it may be removed entirely, the passage being cleared by the occasional introduction of the probe from below; or the patient may wear, during the night, and when the parts have become quiet, a very small style, which there will be no difficulty in general in inserting through the minute and almost imperceptible fistulous aperture that remains. This mode of managing epiphora and fistula lachrymalis will be found preferable to the introduction of small probes through the puncta, the injection of the sac through these, the passage of setons, or the retention of tubes in the nasal duct. The first of these plans is inefficient; the last often answers for a short time, but in the greater number of cases, sooner or later, leads to trouble and mischief. It becomes necessary to extract the foreign body, and difficulty is occasionally experienced in the operation. The head of the tube must be exposed by incision, and a small probe, with a sharp male screw upon it, fixed in its canal. It is thus secured and removed by traction upwards.

Foreign bodies are extracted in the same manner, from the meatus auditorius, as from the nasal fossæ, great care and delicacy in the proceeding being equally necessary, in order to guard against injury of the deep parts, laceration of the membrana tympani, or disturbance of the ossicula, and other delicate and important apparatus. Specula will be found very useful in many cases where a careful examination of the nose or ear is necessary. The presence of matters which interfere with the functions of

the organs, and which may otherwise prove inconvenient, is thus readily detected, and means of relief determined upon. Accumulations of cerumen and foreign matters, wool or cotton, which give rise to uneasy feelings, noise, confusion, and deafness, are easily loosened by the nice and careful injection of tepid fluid, repeated, as may be necessary. Causes of deafness are removed by some of the operations in the fauces and posterior cavity of the nostrils already described, and by attention to the state of the jaws and teeth.

Penetrating wounds of the mouth are treated on general surgical principles; the lodgment of foreign bodies in the loose submucous cellular tissue has sometimes been overlooked, and great and serious danger has ensued from the consequent infiltration, inflammatory swelling and abscess. The propriety of instituting a timely search for and removing such a source of mischief, need not be insisted upon. Some of the evil consequences arising from the bad condition of the teeth and alveolar processes have been shortly adverted to in Chapter IX. But as yet sufficient importance is not generally attached, nor due attention given, to the exciting causes of many of the swellings, abscesses, ulcers, and tumours of this cavity and its neighbourhood.

The pharynx and œsophagus are occasionally injured by the introduction or impactment of foreign bodies. The lining membrane may be lacerated by sharp portions of bone, which penetrating the membrane, lodge partly in the submucous tissue, where their presence for any time is likely to be attended with great and dangerous swelling, or with unhealthy and gangrenous abscess. Coins, pieces of hard, gristly, and tough meat, may be retained, so that their dislodgement, either upwards or downwards, is attended with difficulty. Small-pointed bodies are sometimes entangled for a time in the mucous covering of the fauces or gullet, and occasion by their presence great uneasiness and alarm.

This passage is not unfrequently seriously injured by fluids of an irritating nature, incautiously swallowed, as acids, strong

alkaline solutions, &c. Solid substances may be removed, though sometimes with great difficulty, but the inflammatory action, in any way induced, is often followed by permanent thickening and contraction of the parietes, generally at the commencement of the œsophagus, and immediately behind the cricoid cartilage. The pharynx is often remarkably dilated in consequence. There is a great accumulation and discharge of mucous stringy fluid; the patient swallows with great difficulty, and after very protracted and painful efforts. The narrowed canal is apt to be blocked up entirely by the impactment of small portions of solid food; emaciation follows, and by the efforts to free the fauces of the viscid discharge, the lungs are liable in the end to be drawn into disease. Abscesses connected with the dilatation of the passage, occasionally form by the side of the neck, and the induration sometimes assumes a malignant action. In some cases from the first morbid structure of a carcinomatous or medullary nature, is the cause of the obstruction.

The introduction of instruments into the fauces and gullet, is frequently required for the removal of foreign bodies which have lodged, and in some cases immediate recourse must be had to the operation on account of interference with the functions of the larynx, and the risk from threatened suffocation. Small sharp substances, as pins, needles, fish-bones, are generally fixed in the mucous membrane, over the root of the tongue, by the base of the arches of the velum, and within reach of the finger; they can generally be disentangled and removed by the skilful use of a pair of long and slightly-bent forceps guided by the finger. Foreign matters, of large size, impacted in the narrow part of the canal, can be, if of soft consistence, pushed down by the introduction of a probang, a small bit of sponge, or what is better, a small ovoid and smooth piece of ivory, firmly secured on a whalebone rod. In introducing this instrument, the head and face are so placed, well held back, that the canal is brought pretty much into a straight line. The patient is desired to make an effort to swallow as the ball is passed over the root of the tongue; it is thus easily slid over the epiglottis, and enters the

gullet. The pressure must be very gentle on the obstructed part. If the passage has been previously constricted, a smaller instrument of the same kind may be tried, or an œsophagus bougie substituted. Hard and angular bodies must be brought upwards, and for the purpose of seizing these, long, bent forceps, one pair made to open laterally, another from behind forwards, will be required to ensure a successful issue to the attempt. The finger is passed as a guide, and the same precautions are taken to avoid interference with the glottis, as in the use of the probang. The cause of the obstruction is felt, grappled with, and seized. The extraction of pieces of bone, or other sharp and irregular bodies, as glass or broken china, must be cautiously gone about; the dread of still further injuring important parts, being before the eyes of the surgeon. Flat and smooth substances, coins, &c., may be disentangled readily by a flat, blunt hook, fixed on a piece of whalebone, or a piece of thick, flexible wire, twisted and bent to a convenient form. A foreign substance has been so fixed in the gullet that it has been considered impossible or unsafe to dislodge it upwards or downwards. Nourishment could not be received into the stomach, and the respiration, it has been thought, might thus be interfered with by pressure on the posterior membranous surface of the air-tube. But the obstacle is behind the cartilages of the larynx, which are pretty incompressible. In these cases an incision has been made into the œsophagus from the side of the neck, on its left side, the foreign body has been felt, and care being taken to steer clear of the vessels and nerves, more especially the inferior thyroid, and the recurrent, the tube has been cut through and extraction accomplished. The necessity for this proceeding can seldom arise.

Patients labouring under the effects of injury, or under disease of the air-passages, require to be promptly attended to and very judiciously treated. The physiology of the organs must be carefully studied, and the functions of that "outwork," as Mr. Porter, of Dublin, in his excellent work, has denominated the glottis, perfectly comprehended; the pathological changes, moreover, must be thoroughly and well understood by the surgeon who proposes to undertake the management of such cases. In-

juries from without are constantly presented to the notice of the profession; not a week passes without some cases being detailed in the public prints, of attempts at suicide by wounding the windpipe; very generally a most mischievous practice is, at the same time, described as having been adopted, a practice calculated to cut off the slightest chance of recovery, which, in some instances, is very desirable, and even after all anxiously wished for, by many of the unfortunate individuals themselves. A servant went to fetch some water, on returning "he discovered his unhappy master lying on the floor, weltering in his blood, having cut his throat with a razor; surgical assistance was procured as promptly as possible, and the wound was sewed up, but no hopes are entertained of his recovery." It should be added, rather, that in consequence of the ill-timed interference and mis-directed attention, every ray of hope had been shut out from the poor sufferer. The same remark applies to the treatment which, from the same authority, appears to be generally adopted after severe accidents. A person receives a serious injury on the head, or of the chest or limbs; he is taken up pale, bleeding and insensible; carried to a practitioner, perhaps an unlicensed one. He expires shortly after, or he is, it is said, not expected to recover, even though "he had the most prompt assistance afforded, and was immediately bled." The injured person has in these circumstances a much better chance of recovery when let alone for a time, to allow of the re-establishment of the circulation, than when exposed to such misapplied attentions, to such unceremonious and ill-judged practice, as abstraction of the vital fluid at so improper a time, when it can be so little spared, and in fact when the loss of a very trifling quantity will go far to extinguish the small remaining spark of life.

Wounds of the fore part of the neck and of the blood-vessels in that region are treated of at p. 157. The implication of any part of the air-tube increases the danger very considerably. The division may be partial or complete; it is almost uniformly across the axis of the tube, and is met with at all points, from opposite the top of the sternum to the root of the tongue. In a great many instances the os hyoides and tongue are severed from the

larynx; the mouth is sometimes penetrated above the epiglottis, the box of the larynx is cut into through the thyroid cartilage, or crico-thyroid membrane; more rarely the trachea is penetrated; the pharynx is, in some cases, opened at the same time along with the larynx. The mode of managing the hæmorrhage, one immediate source of danger, has been already adverted to; the patient is watched when re-action occurs. The state of mind in those who have attempted suicide is often unfavourable to recovery; they may still be determined to get out of the world, and may, if not restrained, take active means to accomplish their end. They may tear open the wound, induce a recurrence of the bleeding, or by introducing the fingers into the open wind-pipe obstruct the entrance of air. They sometimes refuse sustenance, and by their despondence and carelessness of life do away with every chance of a cure. But independently of these circumstances, there are many physiological and pathological difficulties to be overcome; the air and secretions pass out through the wound, as do also, in many cases, liquids and portions of food received into the mouth; this occurs in some cases though the œsophagus is unopened, owing to disturbance of the functions and imperfect closure of the glottis. Blood and serum are moreover liable to be drawn down in such quantity as to obstruct the bronchial tubes and air cells. The patient is deprived, if the wound is below the glottis, of the power of expelling the fluids that may be secreted in, or that may pass from, the wound into the wind-pipe. He is liable to inflammation of the lining membrane of the air passages, (bronchitis,) in consequence of the entrance of cold air directly into them, without admixture with that in the upper part of the canal, in the mouth and nostrils, which in the natural state has been respired, and is of a higher temperature than the atmosphere. Again, when the wound is so far approximated, the patient is in danger of suffocation, from the mal-adjustment of the cut surfaces. Sometimes, as when the wound has been inflicted by several applications of the cutting instrument, and with an unsteady hand, portions of the cartilages are partially detached and hang loose in the opening or into the tube, and, according to their situation,

obstruct the respiration more or less; generally the entrance of air is more easy than its escape. Swelling of the soft parts around or in the interior of the tube from inflammatory œdema, or infiltration into the submucous tissue, often give rise to difficult respiration, proving suddenly fatal if overlooked and neglected. The mucus, much increased in quantity, and vitiated, viscid, and tenacious, in all such cases, is got rid of with great difficulty, and is apt to be entangled in the opening thus constricted and narrowed. It is from this cause, and not from any spasm, that the fits of threatened suffocation are induced, both after injury and in some of the diseases of the part. The patient, breathing for some time with difficulty, his inspirations long and whistling, starts from his disturbed sleep, grasps at the nearest object, and falls down lifeless.

The treatment must be conducted so as to obviate these dangers. The wound is of such a nature as regards its direction and the parts implicated, that the immediate union is neither possible nor desirable. The result is very different when the wound is longitudinal. Even superficial transverse wounds which do not reach the muscles, seldom heal without a good deal of discharge, and by the second intention. The motions of the head and neck, the change of position in the parts, caused by the action of the muscles of the tongue and larynx, and the constant passage of fluids through the wound, are all opposed to union. The immediate apposition of the divided surfaces is attended with great danger; the blood, as it flows from the vessels, and encouraged by the confinement of soft coagulum, passes by suction into the windpipe; some of it may be ejected, but the lower part of the tube is not very irritable, and the power of coughing is diminished, so that great part trickles down and fills gradually the extreme branches of the tube. The breathing is quickened and slightly embarrassed, yet everything may be supposed to promise well; the patient, however, in making some slight exertion, without warning to the inexperienced, falls suddenly into a state of asphyxia, and is lost. The same thing happens at a later period from the secretion of serum or accumulation of mucosity. The tubes and cells are found loaded, and the lung condensed. After the bleeding vessels have been se-

cured, the patient should be placed in a room of comfortable temperature, and the fore part of the neck protected by some loose covering, as a muslin or gauze handkerchief, or what is better, a worsted comforter. The loose texture becomes somewhat heated, the expired air is retained in it mixed with that which is drawn into the air-passages during the next expansion of the chest, and the danger of bronchitis occurring is thus so far obviated. When matters are permanently arranged as regards position, one of Mr. Jeffrey's respirators, a most ingenious and useful contrivance and one of invaluable and vital importance to individuals liable to, or suffering from, pulmonary affections, may be applied with great advantage. The inspired air will thus be brought to the same temperature as in normal respiration, and upon attention to this, much of the success in the management of the case will depend. The solution of continuity cannot with safety or propriety be brought together for many hours after its infliction, until all oozing has ceased, and the surface is glazed. No purpose is to be gained by closing the wound accurately by stitches and plasters; if it extends laterally to a great extent a single point of suture may be inserted near each extremity, of course only through the integument; but the centre cannot heal, and no attempt need or ought to be made to close that.

Great and imminent danger, as has already been pointed out, arises from the closure of the wound and the consequent inhalation of blood, but even though the air-tube is not opened, the patient may be put in great jeopardy by the close apposition of the edges of the incision. The blood is apt to accumulate in the cavity, and coagulates; hæmorrhage is thus kept up; the size and pressure of the clot may even interfere with the function of respiration. A young woman was admitted into the North London Hospital, some months ago, on account of a transverse wound of the fore part of the neck over the upper part of the thyroid cartilage. It was ragged, had been inflicted by repeated application of the cutting instrument, and the integument had been somewhat detached from the subjacent parts. The wound was stitched closely before her admission; the then house-surgeon, disregarding the common-

sense view of the case, and despite of the principles which I had over and over again inculcated, very foolishly did not throw the edges loose, even though the wound had bled repeatedly and the patient did not breathe with freedom; I was making my visit in an adjoining ward, when the nurse rushed in to say that her patient was dying of suffocation, and she was correct in her statement; the patient was gasping for breath, with a livid countenance, and scarcely any pulse. The stitches were immediately cut out and a large clot removed. There was no further bleeding, the breathing became unembarrassed, and all did well.

By position of the head, by approximating the chin to the top of the sternum, securing it there by the turn of a double-headed roller, the ends being fixed to a band embracing the chest, gaping and retraction of the edges are prevented, and the parts put in a favourable state for union by the second intention. So long as air passes through the wound no dressing need be applied, the discharges being wiped away and the neck covered as directed above. In wounds which do not penetrate very deeply the patient can take sufficient support at any stage of the case, but when the pharynx is implicated it will be necessary, from the first, to convey, at proper intervals, liquid nourishment into the canal beyond the wound. There is no use in passing long tubes into the stomach for this purpose; a large elastic catheter and gum bottle will be found quite sufficient for the purpose. When the edges are so far retained together by position of the head, the patient will, unless the wound be very extensive indeed, find no difficulty in clearing the windpipe of the mucous secretion, which is often abundant and viscid; the more so if the precautions against the entrance of cold air into the passages have been strictly enforced. If difficulty is experienced in expectorating from the wound, supposing, as is often the case, that the breathing is carried on for a time in a great measure through it, instructions should be given to the patient to narrow the aperture by the application of one or more fingers during his attempts at coughing. Should the respiration, at any period, become embarrassed, the inspiriations

rare, noisy, and difficult, the utmost attention must be given to the case; the cause must, if possible, be removed, and should suffocation be threatened from the great and often rapid narrowing of the opening, by œdematous swelling and the entanglement of viscid discharge, then it may be prudent to open the windpipe longitudinally below the obstructed part.

A great error is sometimes committed in the treatment of cases of cut-throat. The patient is fed through the wound in the neck, the contraction is not favoured by position, and the surfaces are permitted to cicatrize separately; the voice is consequently lost, the patient is rendered perfectly incapable of exertion, not having any control over his respiration, and being thus unable to keep his chest expanded. The patient is, moreover, put in great jeopardy; he is subject to bronchitic attacks and to inflammatory œdema of the orifice through which the air enters; he may thus be cut off suddenly, if in the hands of ill-informed or inexperienced persons, or he may be worn out by cough and profuse expectoration. It is possible occasionally to remedy even such mismanaged cases; the contracted air passage above may be widened by the introduction of instruments, and the edges of the wound pared and brought together. A very remarkable case of the kind, which occurred in my practice, is detailed in the Edinburgh Medical and Surgical Journal, vol. xciv. p. 118, and in the "Elements of Surgery," vol. ii. p. 243. The patient had the opening through which she had breathed entirely for many months, and in which, in fact, she wore a large round tracheotomy tube, closed, after dilatation of the opening leading upwards into the glottis, which was apparently almost obliterated; and although it was necessary to perform tracheotomy on account of the swelling which supervened and threatened suffocation, a few hours after the removal of a piece of elastic tube which had been worn for many days in the trachea, a perfect recovery took place, the breathing became free, and the voice was almost perfectly restored.

The respiration is sometimes interrupted for a time, and the functions of the larynx interfered with in consequence of injury,

blow, or contusion on the fore part of the neck. Emphysema may arise from division of the membrane connecting the rings of the trachea, or from fracture of the ossified cartilages of the larynx; inflammatory action may be lighted up, causing difficult breathing, loss of voice, and pain in deglutition, with more or less fever. A case is related in the "Elements of Surgery," vol. ii. p. 257, in which the breathing was suspended almost entirely in consequence of an injury on the fore part of the neck. The little girl fell, in running across the street, and struck the larynx with great force on a large stone. She was almost moribund when seen shortly after; the trachea was opened, respiration established, and a complete cure effected. It was found necessary to retain the tube in the wound for eight days, until the swelling had subsided and the functions of the muscles of the larynx had been restored.

The glottis is injured by the introduction of fluids by the mouth, as strong acids. A case was brought lately to the North London Hospital, in which the breathing was suspended in consequence of the patient, a little girl, having attempted to swallow a mouthful of undiluted sulphuric acid. Tracheotomy was performed and respiration established by inflation of the lungs persevered in for some time. A tube was introduced but withdrawn within two or three days; a suddenly fatal termination took place, it would appear, from the accumulation of viscid mucus in the trachea and larynx, which the swollen state of the rima rendered it impossible for the poor child to get rid of.

The swallowing of heated fluids, the inhalation of the steam of boiling water, as from the spout of a tea-kettle, is attended with a certain degree of excoriation of the mouth and fauces. But it is the glottis which suffers most seriously in these cases, and of which the consequent affection is to be dreaded. The respiration very shortly becomes much hurried, the inspirations are often sibilant, the features suffused, the lips blue, the veins of the neck distended, and a short tickling cough troubles the patient. There is pain and difficulty in deglutition. Post mortem examinations have shown, in addition to the excoriation of the mouth

and fauces, infiltration of serum into the submucous tissue of the rima glottidis, with small and numerous vesicles on the surface, more redness than natural of the membrane within the larynx, and a coating of viscid mucus or of lymph. Should repeated doses of calomel, assisted by leeching, fail in arresting the urgent symptoms, suffocation is dreaded, recourse must forthwith be had to tracheotomy; in all such cases, temporising and delay are perfectly inadmissible; as a consequence of the difficult respiration, and the imperfect circulation through the lungs, the vessels of the head soon become congested, effusion follows, and the patient is lost.

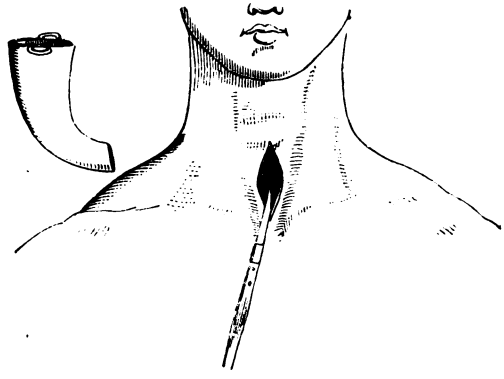
The lodgment of foreign bodies in any part of the respiratory apparatus, is always an alarming and dangerous occurrence, and if they are not removed a fatal termination must sooner or later ensue. The patient may be suddenly suffocated very shortly after the accident has taken place; the distressing symptoms may abate and recur suddenly in a few hours or days, or after the lapse of some time; cough, profuse and very fœtid expectoration with wasting, and consumptive symptoms ensue, and then the escape or removal of the foreign body, in all probability, will prove of little avail. The signs and symptoms, of course, may be expected to vary according to the form, size, and nature of the foreign body and the situation which it occupies; according, also, as it is moveable or fixed. The substance may be entanged for a time either in the upper or lower part of the windpipe and then escape; it may continue to shift its ground, and again become impacted, either in the same or some other situation. The diagnosis is not always an easy matter, more especially in children; perhaps the history is incomplete, and the symptoms at the time are not well marked. If a foreign body is said to have passed into the throat, any doubt as to its having entered and lodged in the gullet can soon be removed by the introduction of a ball probe. The symptoms must be watched, and a correct examination instituted. In the first instance, the patient may have experienced a sense of impending suffocation, he will have been greatly agitated and alarmed, during the passage of the foreign body through the glottis, and for a time the inspirations may have been difficult and noisy, the expiration short and forcible, with efforts by coughing to get

rid of the source of irritation. The body, if smooth and not very large, may have entered readily and without much excitement, the glottis being expanded during inspiration; but it cannot escape, though quite loose, in consequence of the narrowing during expiration. After the first paroxysm of coughing, a calm of some duration may succeed and continue for a considerable time, so as to lull all suspicion. The substance, if loose, comes in contact, at times, with the rima glottidis, the sensibility of which is extreme, and all the suffering, alarm, and agitation, are renewed. A peculiar noisy characteristic ralé is perceived upon applying the ear, and the shock like the shutting of a valve can be thus appreciated, or even by the finger placed upon the box of the larynx, when the foreign body, by the forcible expiration, is made, to strike the rima. The entanglement of a substance in one of the ventricles of the larynx, naturally causes sonorous ralé, loss of voice, occasional cough, and difficult inspiration; the symptoms are constant, and increase in severity as swelling takes place, and the secretion becomes profuse.

The presence of a foreign body in one of the bronchi may sometimes be ascertained by sensible signs; the right bronchus, as being the largest and most directly continuous with the trachea, is almost uniformly the one into which it is received. The signs vary according as the tube is filled entirely or not, and that will depend on the form and size of the mass. The respiratory murmur may be indistinguishable, or it may merely be diminished in loudness, less distinct than on the opposite side, whilst on percussion the sound is equally good. The murmur may be heard after coughing, when for a time dislodgment of the substance may have been effected. A curious case is related by Mr. Macnamara of Dublin, in which the signs of the presence of a foreign body were very unequivocal; a plum-stone, perforated and used as a whistle, dropped into the windpipe and lodged in the right bronchus; the air rushing through the opening caused a distinct whistling sound. An opening was made in the crico-thyroid membrane, and the signs disappearing, it was thought that the substance had been forced through the glottis and swallowed; but in eight days the same signs pre-

sented, the opening was enlarged, and it was at last ejected during a violent paroxysm of coughing. A great many cases have lately been collected and published, in which foreign bodies had been lodged for a time in the air passages and ultimately ejected. A button mould, nail, ear of grass, cherry-stone, pieces of bone, of wood, of woollen stuff, false teeth, &c. &c., have after many months of suffering from cough, fever, and expectoration, been got rid of by patients without much, if any, assistance from their medical attendant. Many of these substances are said, without any very satisfactory evidence, to have been lodged in the right bronchus, and it is probable enough that most of them were so placed. Some few of these individuals recovered by chance; in others, the marasmus continued, and they soon after perished, in consequence of the neglect to ascertain the true nature of the disease, and remove the exciting cause of the mischief in proper time. In some of the cases the attendant was kept in ignorance, any mention of the entrance of a foreign body into the air passages having been omitted by the patient. Other cases are on record, in which foreign substances have been found at the end of some years in the cavity of abscess in the lungs. There can be no question when a foreign body has entered into the air tube, that the sooner it is got rid of the better, whether it lodges in the larynx, floats loosely in the trachea, or is impacted in one of the bronchi. Every means must be adopted by the surgeon to enable him to arrive at a correct understanding of all the circumstances of the case. He must make sure that there really is a foreign body in the tube. He must ascertain its nature as regards form, size, and surface; he must make up his mind as to where it is placed, whether it is loose or fixed. In some cases there can be no doubt, and the means of relief, owing to the urgency of the symptoms, must be adopted promptly and on the spot. In others again, there is great occasion, and there is time also, for deliberation on the nature of the case, and the practice to be pursued, as the symptoms, though not admitting of long delay, are not urgent or pressing, the patient having been for weeks or months previously much in the same

state. No trust is to be put in any therapeutic means even in the most chronic cases. Errhines, emetics, and demulcents, are alike useless. The existence of a foreign substance being clearly ascertained, an opening must be made into the trachea. If loose, it will generally appear at the opening and be ejected, or it can be laid hold of and its escape facilitated by the use of a small scoop or bent probe. If fixed in the larynx, entangled in the rima, or lodged in one of the ventricles, the foreign body can be felt by the introduction of an instrument upwards; it can then be seized, or it can be displaced either upwards into the fauces, or brought down through the opening in the neck. But should the bronchus be the seat of the obstruction, then the surgeon must be prepared to encounter greater difficulties than in the other case. He must provide himself with a long probe and forceps bent variously, fashioned at the point according to the size and form of the substance he expects to meet with, and made to open, some laterally, others in the opposite direction. The opening in the neck is made as here represented. A small scal-



pel is best suited for the purpose; in the adult an incision of from an inch and a half to two inches is made, the extent varying according to the thickness and length of the neck, the depth, in fact, at which the windpipe is placed from the surface. The opening is made to extend from immediately below the cricoid cartilage to near the top of the sternum, and exactly in the mesial line. The skin and superficial fascia are first divided,

the fatty matter underneath is cut through, the deep fascia exposed and slit up over the junction of the sterno-hyoid muscles, their cellular connexions are separated with the point of the knife; with its handle, and with the finger, by which it is ascertained that no stray arterial trunk lies in the way, the fore part of the trachea is cleared of the loose cellular tissue and congeries of veins; these are pushed downwards, the isthmus of the thyroid body, if it exists, pushed upwards. The patient is desired to swallow his saliva; the moment is seized, when, by this action, the larynx is elevated and the tube elongated; the point of the knife is entered into the rings with its back towards the sternum, and by a slight sawing motion, three or four of them are divided upwards and in the middle line. By proceeding thus, there is seldom bleeding to any troublesome extent, nor is there any occasion for tying vessels, or for pausing before completing the opening. The alarm consequent upon the admission of air thus unnaturally into the ramifications of the trachea having subsided, a search is instituted for the foreign body by the introduction of the probe. The forceps follow this, and by their gentle and cautious use, the object may be attained.

Only one case, it is believed, is on record in which a foreign body was actually discovered in, and removed from, the bronchus. The circumstances are fully detailed by Mr. Duncan, Surgeon, Edinburgh, in the "Lancet," vol. ii. 1833, 34, p. 419. Mr. Duncan was my house-surgeon in the Edinburgh Royal Infirmary, at the time the operation was performed; in this capacity I had the advantage of his services, and very able assistance, for a long period, both in that institution and in the North London Hospital. The patient, a female, aged 37, had, at least six months previously, got a piece of mutton-bone entangled in the glottis, whilst eating some hashed meat. By a great effort, in a fit of threatened suffocation, she succeeded in dislodging it, but it passed downwards into the trachea. She described very accurately her feelings at the time, the relief she had when it left the rima, and the sensation produced by its passing down till it lodged permanently under the right sterno clavicular articulation.

An attack of bronchitis supervened, followed by cough and expectoration, and the inflammatory attack was repeated several times; from one of these she had recovered, when she presented herself to me. The history was very clear, the inspiration was somewhat noisy, and there was some degree of peculiar sonorous ralé perceived on applying the ear to the chest at the point described, as where the foreign body had become fixed. The operation was performed as above directed; one pair of forceps, those opening laterally, were introduced; a hard substance could be felt, but not grasped; the patient was reassured, allowed to recover the effects of the exploration and attempt to seize it. Another instrument, with the blades differently arranged, was passed down the tube, at least three, or three and a half, inches, and the bone immediately seized and extracted. Cold water was applied over the wound for some hours, and after all risk of oozing, and escape of blood into the trachea, or of air into the cellular tissue, had ceased, it was put together with a bit of plaster. The result of the case was most satisfactory; all the symptoms ceased, and the patient was speedily restored to the enjoyment of perfect health.

It may, and often becomes necessary to resort to the operation of tracheotomy, on account of obstruction to the free entrance of air into the lungs, caused by disease at the top of the tube. It is not often admissible in cases of acute inflammation, cynanche, trachealis, either in children or adults. In the first stage, whilst active antiphlogistic remedies are indicated and considered likely to afford relief, it could not with propriety be proposed. In the latter stages, after lymph has formed, the extent of which it is impossible to predicate very correctly, when the lungs are gorged and effusion has commenced at the base of the brain, no good purpose can be answered by an operation. In some few cases, more especially in adults, the happy moment for interference may be chosen; and if the trachea is opened, instead of the larynx in the crico-thyroid membrane, there is a chance of getting below the part involved in disease, and obstructed by plastic effusion. Under all circumstances, tracheotomy is to be

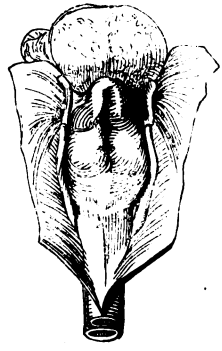
preferred to laryngotomy; the latter, it is true, is much more simple. There is but slight risk of any vessel traversing the crico-thyroid membrane, likely to cause trouble, and this structure can be divided, together with the superimposed skin, at once, and without dissection or precaution of any kind. The proper point must be fixed upon, and the opening made where it is intended. It has happened that a perforation has been formed higher up still, quite above the obstruction, into the mouth, in fact, betwixt the thyroid cartilage and os hyoides. Sufficient room cannot be well made in the crico-thyroid membrane for the examination of the site, or for the removal of a foreign body, and in operating for disease the opening falls in the middle of it. A very beautiful specimen of the effects of cynanche laryngea in the adult is preserved in the museum of the Edinburgh University, with an opening in the crico-thyroid space and in the middle of the false membrane. The operation was undertaken late in the disease, when the patient was in articulo mortis, and when, in all probability, it could have served no purpose had it been better planned. Under any circumstance, from an inspection of the preparation, it is plain enough that laryngotomy, at least, could have afforded no chance whatever to the patient.

In chronic disease of the larynx, in some stages of ulceration of the membrane and cartilages, (laryngeal pthisis,) when the mischief is still confined to this spot, advantage may be derived from opening the trachea. This step may sometimes, in well-marked cases, be adopted with a view of setting the parts at rest, and of affording opportunity of making applications more readily to the affected surface. The constant irritability, cough, expectoration streaked with pus and blood, noisy laryngeal respiration, pain referred to the part, and increased on pressure, loss of voice, and difficulty in swallowing, inability to undergo fatigue and exertion, emaciation, and hectic, will lead to a strong suspicion of ulceration to some extent, about the rima glottidis. Its existence can often be ascertained by passing the finger deeply in the fauces; the edges and under surface of the epiglottis, which is often much affected, as well as the opening into the glottis, can thus be felt.

The symptoms vary according to the progress of the disease, and the extent of ulceration in various parts. The partial destruction of the epiglottis, or of the edges of the opening of the membrane covering the arytenoid cartilages, or the extremity of one of these, so as to render the occlusion of the aperture into the larynx imperfect, give rise to great irritability of the parts, and coughing on the attempt to swallow liquids. It becomes next to impossible for the patient to receive the least quantity of liquid nourishment, when the destruction of these parts has proceeded far. Again, when inflammatory œdema has supervened, as it often does, upon these ulcerations, or others in the neighbourhood, in consequence of sudden suppression of discharge from the parts—from imprudent exposure to cold or moist atmosphere, or from injudicious treatment,—when the submucous tissue of the epiglottis and rima, and more especially when that covering the body of the cricoid cartilage is infiltrated to a great extent, the patient is incapable of swallowing solid food. Occasionally the circumstances are such as almost entirely to preclude the possibility of taking nourishment in any form. The existence of this swelling can often be ascertained by a careful examination with the finger, and by means of a speculum; by such a glass as is used by dentists on a long stalk, previously dipped in hot water, introduced with its reflecting surface downwards, and carried well back into the fauces, a view may often be had of the parts. The lungs are too frequently involved in disease at the same time. The two diseases may go on from the first *pari passu*, acting and re-acting on each other, or the affection of the chest may result from that of the larynx, and may be the consequence of the constant and violent succussion. The less severe or extreme cases may be managed by the free and occasional application of the nitrate of silver in solution, by means of a piece of lint or sponge well soaked in it, by the establishment of discharge from the vicinity, and by attention to and improvement of the general health. The disease, when extensive and of long standing, is very unmanageable, and should the ordinary means fail, the lungs being, by careful examination,

found tolerably healthy, then tracheotomy may, as a last remedy, be resorted to. Applications may thus also be made to ulcerated parts that cannot be reached from above; the secretions are got rid of with less exertion and more easily, and the cough abates in a great measure. The patient can arrange so as to force out the air through the artificial opening in such a way as to carry the discharges with it, and without much exertion of the lungs. Here, as in all other cases, where the windpipe is opened intentionally or accidentally, the adaptation of the respirator, or some substitute for it, will be found indispensable.

In the cases in which swelling comes on in any stage of the disease, and whatever may have been the previous circumstances, recourse must often be had to tracheotomy, in order to prevent a speedy and suddenly fatal termination. The œdema of the glottis may result from inflammatory action originally of the part or which had spread from the neighbouring surfaces to it. It is acute or chronic; it often supervenes upon inflammation or ulceration of the velum, fauces, or tongue, from continued irritation in the posterior alveoli and gums, from faulty or deranged molar or wisdom-teeth; not unfrequently an affection of the fauces attended by œdema follows upon erysipelas of the face. Some of the symptoms may be simulated by tumour at the bifurcation of the trachea, which, by its size, interferes with respiration, rendering the inspirations long and difficult, and also with deglutition, preventing solids from passing readily. The nature of œdema glottidis, and its probable consequences, will be best understood, by reference to the accompanying sketch. In this case the termination was very sudden. The patient, a young man, had been under my care in the hospital, on account of deeply-ulcerated tonsils, for which he had been previously treated with mercury; in a few weeks he recovered from these sores, by the abstraction of the local cause, by the occa-



sional application of the nitrate of silver, and the use of sarsaparilla. In about ten days after his dismissal, with a mere abrasion on one side of the fauces, I was requested to examine his body. He had led a dissolute life after he went home; had used stimulants freely, and had been out for some nights very late, the weather being at the time very unfavourable. He had complained for two days of sore throat, with cough and some difficulty in breathing and swallowing, and had staid at home in consequence; no advice was sought; he was sitting by the fire smoking his pipe one evening, when suddenly he started on his feet, rushed to the door, and fell down in a state of asphyxia; a practitioner came, and, as usual in all cases of injury or sudden seizure of any kind, no matter what, tried to bleed him,—he was dead. Every part was sound excepting the fauces, which had again been slightly ulcerated, and the larynx, from which the above sketch is taken. It is preserved as one of a very extensive series of pathological specimens of this organ in my private collection.

The accumulation of serosity in the subcutaneous tissue of this important part, as can readily be understood, is attended with laborious inspiration, increase of secretion from the surface, difficult expectoration, and cough. The expiration is comparatively free and unembarrassed, but as the rima becomes narrowed, the inspirations are rendered more and more noisy and rare, are accomplished with a greater effort, and very imperfectly. All the muscles which expand the chest are called into powerful use, and the shoulders are raised and fixed, in order that some of them may act with greater effect. Fits of threatened suffocation come on from time to time, more especially when the patient has been thrown off his guard, when he has been asleep for a short time, and the viscid and tenacious mucosity has been allowed to accumulate in the trachea and larynx. In the more severe cases the patient dare not trust himself to take the slightest repose; he remains in the erect position wakeful. Suffocation often takes place very suddenly, the patient starts up supposing that he is drowning, or being suspended by the neck, he utters an exclamation, grasps at some object, and sinks down insensible and with a total suspension of breathing. This happens occasionally, as already hinted

at, and from the same cause in the advanced stages of wound of the throat, when the treatment has not been carefully looked to, and when the accession of urgent symptoms is overlooked. From the swelling of the epiglottis causing it to remain in an erect position, as well as from the general enlargement, the passage of solid food is difficult, and even liquids must be taken with caution, lest any drops should pass into the glottis, which cannot be accurately closed as in its normal condition. In order to relieve the urgent symptoms and to prevent the untoward termination of the case, it will often be necessary to resort to operative procedure; efforts may have failed to relieve the symptoms by general means, emetics, demulcents, expectorants, antispasmodics, &c.; these are not much to be depended upon, at all events after a certain period, and the practitioner who would persist in their use to the prejudice of the patient, who would endeavour to lull him into a fatal security after urgent symptoms have arisen, will have himself much to blame. The cause of danger has been explained; it is mechanical, and spasm has little or nothing to do in the matter. The swelling, when it affects the epiglottis and rima to any extent, can be distinctly felt, and this will, if need be, confirm the diagnosis. Local means are of little avail in arresting the symptoms or removing the swelling; it may be punctured, and counter-irritation may be used in all ways on the side of the neck, but dependence is not much more to be placed on these means than on the general ones. By the way, in affections of the larynx, it should be kept in view, that in spite of all measures the symptoms are likely to become aggravated, and the case to become urgent; the possibility of its being requisite to make incisions on the fore part of the neck must accordingly be considered. The discharge should be excited from the sides of the neck, and from the fore and upper part over the box of the larynx. I have more than once been called upon to perform tracheotomy in cases, which had been under treatment for some time, where blisters and antimonial ointment had been again and again applied over the whole fore part of the neck; the consequence was great thickening and condensation of the skin, and of the cellular

tissue down to the tube. The incisions were made with difficulty, their depth was much greater than usual, and from the matting of parts it was impossible to seet or feel what was being cut, as it is in the natural condition of these structures, or to avoid parts of importance, such as the inferior thyroid artery, if pursuing an irregular course. Recourse to the operation of tracheotomy is more frequently demanded on account of œdema glottidis, than any other circumstance, and it is generally attended with a happy result. The diseases of the larynx are exceedingly prevalent in the northern metropolis, and I must have performed the operation nearly twenty times, and with almost uniform success, for chronic swelling, with such urgent and threatening symptoms as above described. The steps of the operation are not varied in any respect from those detailed in treating of the extraction of foreign bodies, but means must be taken to keep the wound patent. It has been proposed to remove an oval portion of the tube; this is a difficult matter, does not serve the purpose long, and is apt to be followed, after the healing of the wound, by inconvenient and dangerous narrowing of the trachea. An instrument like a small dissecting-forceps has been used, by the separation of the blades of which, through their elasticity or otherwise, the edges of the opening in the rings have been kept apart; this contrivance is inefficient and is not to be depended upon. The proper plan is to insert such a tube as that represented p. 346, curved and large enough; after a few minutes all irritation from its presence ceases; many of those sold for the purpose are much too small and straight. This tube of a conical shape, flattened laterally, answers best in the first instance; the edges of the incision throughout are compressed by it, and oozing prevented; the vitiated mucus can be easily removed by the nurse or assistant by means of a feather, or a curved probe, with a bit of lint fixed in the eye and wrapped round it; after a time the patient can attend to all this himself; he can remove his tube, clean it out, and replace it: then a smaller one, of the same calibre throughout, may be substituted; it may be made double if the practitioner fancies it more convenient or safe, and direc-

tions may be given to withdraw the inner one if suffocation is threatened from accumulation of mucosity. I never saw any use for such a contrivance in adults, as the tube can in a few days be taken out and replaced without pain or trouble, and the breathing is carried on meanwhile quite easily through the wound. The patient clears the large tube by narrowing its orifice with his finger, and he will be able, without resorting to this manœuvre, to cough readily through the small and narrower one.

The time which it may be necessary to preserve the artificial opening will depend upon the state of parts, which rendered its formation necessary; in a few days or weeks it can be dispensed with. This experiment is soon made; it may be found that, though the patient breathes freely for a time after the closure of the wound, the embarrassment and alarm recur during sleep. Some patients cannot or will not dispense with the use of a small tube, and many have worn one for a series of years, the respiration being carried on partly through this, and partly by the natural passage. The voice of course is imperfect, the patient speaks in a whisper, but by closing his tube he can articulate distinctly enough.

An artificial opening of the windpipe is not at all necessary in order to inflate the lungs in cases of suspended animation; a curved tube can readily enough be introduced for this purpose through the natural passage; the tongue is brought forward and the instrument guided on the finger in the mouth, or it may be passed through the nostril.

INJURIES AND DISEASES OF THE RECTUM AND ANUS.

The extremity of the intestinal canal is sometimes injured from without. I have had occasion to treat a good many penetrating wounds of the hip involving the bowel, several in which the foreign body entered the anus, producing lesion of the coats of the bowels, and some also in which the viscera in the vicinity, the bladder, and vagina, were implicated. Small pointed bodies, as pins, occasionally penetrate or lodge in children. These wounds

and injuries must be treated on ordinary and common-sense surgical principles, great trust being put in the efforts of nature. It may be necessary, at some stage of the case, to divide the sphincter of the anus, on one or both sides, in order, by putting the parts completely at rest for a time, to promote the healing of a cavity, or the closing of some false passage. Foreign bodies of various kinds and sizes, clyster-pipes, bougies, &c., &c., have been introduced from without by accident or design, so as to lodge and require surgical interference for their extraction; this may be effected, in general, without much difficulty by the use of a forceps or lithotomy-scoop guided on the finger. A number of cases are scattered through the recrods of surgery, and a very ample collection of these is made by Morand, in the third volume of the "Memoirs of the French Academy of Surgery." The case which occurred to Marechal, in which a pig's tail was introduced into the rectum of a woman of the town by some medical students, whom she had somehow offended, will be read with interest. The trick had been most maturely planned; the tail was prepared for the purpose, the bristles being cut short, and it was introduced with the thick end uppermost; the consequence was, that any attempt to remove it gave rise to the most excruciating pain; the rectum became inflamed, the bowels obstructed, it was necessary to interfere, and this the surgeon did very cleverly: he secured a strong cord to the apex of the queue, introduced a hollow tube, a piece of reed well rounded at the end, over the foreign body, and without pain or difficulty removed both together.

Hard, pointed, and irregular substances sometimes pass along the whole course of the alimentary canal, and are at length arrested at its extremity; they are entangled in the coats of the bowel, and give rise to great uneasiness, or they may penetrate the parietes and lodge in the cellular tissue, causing inflammation, abscess, or even sloughing. Bones of small animals, rabbits, hares, fowls, are now and then detected in the rectum and extracted. I have removed half the jaw of a rabbit, swallowed in a plate of curry, from this situation. Fish-bones, small spiculæ of large ones, after passing so far and retained, are apt to penetrate;

the symptoms are not at first severe, their presence is not ascertained, but their lodgement in the cellular tissue outside is soon manifested by painful swelling. The progress of the tumour to suppuration is the same as in those arising from other causes, and the consequences must be the same.

Many attempts have been made to mystify the subject of diseases of this region, and to separate them, in a great measure, from general surgery. There is no such difficulty, as has been supposed, in understanding their nature; the principles which should guide their management are simple, and the means, operative and otherwise, easily enough applied. The cause being obviated or removed, local measures can be adopted with a certain prospect of benefit in the great majority of cases. Congestion and swelling of the lower bowel, hæmorrhoids, and condylomata, prolapsus of the lining membrane, inflammatory swelling, acute or chronic abscess and its almost uniform result, fistula in ano, are all traceable to a disordered state of the chylopoietic and assistant viscera, or to enlargement or irritation of some kind in the genito-urinary organs of either sex. The evacuation and prevention of accumulation in the alimentary canal, the amendment of the state of the lining membrane, and the correction of the secretions from its surface, by suitable medicines, by lavements, and by a well-regulated system of diet, will, in many cases, go far towards a cure; above all, hepatic derangements are not to be overlooked. In other cases, attention must also be given to the pelvic viscera; whatever keeps up irritation, interferes with the proper and normal functions, or obstructs in any way the return of blood from the parts, should be looked to and obviated as far as possible. Hæmorrhoidal affections accompany, and arise from, pulmonary disease; that such should be the case, and that relief should often attend the consequent discharge, is plain enough; it is equally clear that there should be little interference in such cases on the part of the surgeon; palliative means may be resorted to, but if it were possible to put an end to the external disease, it would not be very prudent to do so.

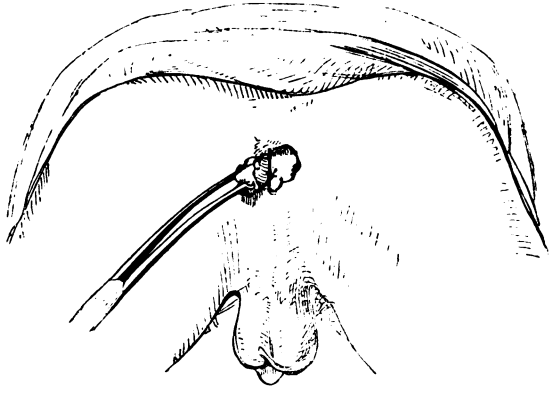
Small and soft hæmorrhoidal swellings, mere distension of the veins, without much thickening of their coats or surrounding in-

filtration, may, after due attention has been given to the indications already noticed, be made to disappear by the use of some astringent. Solutions of astringent salts, as of alum or decoctions, as that of valonia, are to be preferred to the filthy and inefficient unguents that are generally prescribed; their application is more simple and much more effectual. In severe attacks of congestion in the hæmorrhoidal veins, with a certain degree of inflammatory action and great suffering, the recumbent position must be enjoined, blood may be taken away by puncture of the tumours or by leeching, and fomentations assiduously employed, with great advantage and relief. Condylomata, hard white piles, consisting generally of coagulated blood, thickened vein, and extensive vascular and infiltrated tissue, will disappear after a time, by a persistence in constitutional treatment, proper regulation of the functions of the digestive organs, and by the use of astringents. Frequent ablution must be resorted to; if there is much discharge, as from fissures and abrasions, a free application of the nitrate of silver will often produce a rapid change for the better. Condylomata, if very troublesome and of long standing, and not promising to yield readily to general and local means, may be removed with perfect safety. It is often advisable to resort to this step, when their presence gives rise to irritability of the bowel, or neighbouring viscera, the bladder, or uterus, and causes obstruction to the evacuations, with straining, consequent eversion, and falling down of the mucous lining of the rectum. In prolapsus recti, to which the patient has been long subject, the lining membrane, to the extent of an inch or two, is rendered insensible, changes its appearance from exposure and contact with external substances, and approaches in structure to the common integument. It is this part which forms the outer surface of the tumour when extruded; folds of the unchanged mucous membrane, of a dark red colour, present in the centre, its vessels gorged and distended almost to bursting. In many cases the vessels do give way, and furnish, constantly or periodically, considerable quantities of blood, from one or many points. It is only, however, when thus displaced and compressed, that bleeding does take place. Some portion of the lining membrane re-

mains always protruded in bad cases, forming a fold round the anus, and involving the condylomatous tumours. The sphincter of the bowel acts imperfectly in consequence; it remains over-distended, as it were, by the morbid mass which it embraces, and thus loses its tone.

The operation for prolapsus is confined to the external parts, and can be effected by cutting instruments with perfect safety and with comparatively little pain. The removal of internal piles, as they are called, of folds of the mucous membrane, the veins of which are so far congested, is often resorted to very unnecessarily, and the tying off of piles, has been of late years rather a fashionable remedy, as was at one time, in Paris, the cutting for fistula amongst the retainers of a profligate court. If the lining membrane of the bowel is kept in its place, and there is no obstacle above to prevent the return of blood, its vessels are not over distended, and do not give way so as to furnish blood; any morbid thickening that may exist will soon disappear, for there is seldom any tumour within deserving the name of pile. Occasionally thickening does take place of that part of the bowel which has been subject to protrusion, and adventitious formations are met with sometimes on the surface of that portion of the membrane which forms the centre of the prolapsus. These ought certainly to be removed, either by single or double ligature. The base of the mass should be transfixed with a proper needle, (that represented p. 282, is the best,) a strong ligature is tied round it, and the included mass, and the needle then withdrawn; or this is armed before or after being passed, the portions of the ligature separated, and one tied on each side. This is often done on comparatively sound mucous membrane, with a view, it is said, of producing firm adhesions to the subjacent parts, a very unnatural condition of parts, but in nineteen cases out of twenty, it is as hurtful as it is uncalled for. If any mass is to be removed from within the sphincter, the only safe method of doing so is by ligature, hæmorrhage being almost sure to follow, to a dangerous extent, and difficult to controul, as noticed in the first chapter, page 26. The proper operation for prolapsus consists in the removal of the condylomata, and of a portion of the

loose fold that surrounds the verge of the anus, as recommended by our distinguished countrymen, Wm. Hey and John Abernethy; its object is to remove the irritation caused by the external tumour, to permit the sphincter to act freely and without restraint, so that it may recover its due contractility, and moreover cause, by the cicatrization of the incisions around the opening, a condensation and farther contraction of the orifice. The condylomata are taken up by a hook or small vulsellum, and cut away with a pair of strong scissors. The object is effected with much less pain and as quickly by the use of a knife, a probe-pointed straight bistoury, which can safely enough be applied if the patient's steadiness can be depended on. A fold of the relaxed, altered, and protruded membrane is taken up on each side of the orifice, and an oval portion, the axis of which corresponds to the direction of the bowel, cut out. A vulsellum with the hooked



teeth parallel to the handles here shown, will be found most suitable for the purpose of raising the part to be removed.

Abscess near the verge of the anus, whether acute or chronic, and from whatsoever cause it may originate, from external injury, lodgment of foreign body, congestion, or inflammation following an attack of hæmorrhoids, and brought on by exposure to cold, by constipation, and deranged bowels or liver, must, so soon as discovered, be opened without delay. Fluctuation and pointing are not to be waited for, as indications of matter having formed in

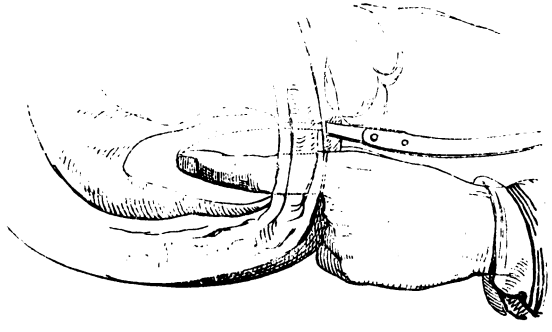
this situation. The history of the case, the deep-seated, pain and hardness on one side of the bowel, with perhaps slight projection and dark discolouration of the surface, will warrant recourse to incision. In many cases the progress of the case is slow, and relief may have been felt as regards all the symptoms, upon the discharge of some matter by stool. But, again, a fresh accession of swelling and of pain, aggravated by pressure or action of the muscles of the part, has occurred. The opening should be made very free, an inch or more in length at least, according to the size of the tumour, and to the same extent in the cyst, as in the external covering. By proceeding thus at an early period of the case, there is a chance of the cavity contracting and healing up permanently. The cavity, though it contracts generally to some extent, continues to discharge pretty copiously, and this is not unfrequently to be ascribed to delay in making an opening; leeches and lotions having been persisted in long after matter had formed. It may also arise in consequence of the unfavourable situation of the abscess, or the imperfect and difficult return of blood from the diseased parts, more especially if the alimentary canal, or any of the pelvic viscera, are disordered. Again, the weak vitality of the fatty matter in which the abscess is situated, or the frequent action of the levator ani in all the evacuations of the bowel and bladder, by which the sides of the cavity are disturbed and prevented from coming together, may form impediments to its closure. The persistence of discharge may also in a great many cases be the consequence of a communication existing between the suppurating cavity and the bowel, through which flatus and fluid fæces enter the cavity and thus keep up a constant irritation.

A fistula is thus established, and it may consist of one sinus more or less narrow, and extensive, running from an opening betwixt the verge of the anus and the point of the hip towards and along the coats of the bowel—the blind external form; or there may be a communication established with the rectum, somewhere above the sphincter—the complete form. More openings than one may exist in the integument, and there may be a good deal of hardness around. Several tracks may commu-

nicate with the principal one, from the buttock, perineum, &c., the result either of the original abscess, which has been permitted to attain a great size, or of consecutive ones. The parts may have become tranquil upon the spontaneous escape of matter into the bowel, the uneasiness may have, in a great measure, ceased, and the swelling may have almost entirely disappeared; the discharge still, however, continues in greater or less quantity, and alarms the patient. By careful examination an opening is discovered internally, and a corresponding hardness may often be perceived by pressing the finger deeply by the side of the bowel. The patient will generally be able to give information which will guide the surgeon pretty accurately to the affected part. A probe may even be turned, with some care, from the opening in the bowel, so that its point shall be felt externally and used as a guide in further proceedings for the cure; this is the blind internal form of the disease.

The principle of treatment is the same in all. In the operation recommended for aggravated piles and prolapsus, the object was to produce permanent contraction, and to enable the sphincter muscle to perform its functions and act with freedom. Here, again, with the view of favouring the contraction and consolidation of suppurating tracks, of putting ulcers and fissures about the verge of the anus in a condition to assume a healthy action, the object of the surgeon is to widen the outlet for a time, and incapacitate the sphincter from acting at all. The evacuations then take place without effort, and this is rather an uncomfortable state for the patient. The power of retention is however gradually recovered, and before that takes place, if the treatment is otherwise well conducted, the sores have healed and the discharge has permanently dried up. The patient must be made aware that, if any, but a remote and a very hopeless prospect of cure can be held out, unless by the aid of an operation—but that is neither severe nor dangerous; he must be properly prepared for it, should he agree to submit. The digestive organs, if not before put in good order, must now be attended to, and their secretions corrected. The bowels should, as a

prelude to all operations on those parts, be well cleared beforehand, so that it will be possible, by the exhibition of opiates from time to time, to prevent their acting for several days; much pain is thus avoided, and the dressings are not disturbed until discharge is established. In due time some mild purgative is given, and the action facilitated by the injection of warm oil or gruel. These precautions before and after are equally if not more necessary in the operation above described for prolapsus recti. The patient is by far most conveniently placed, for all operations at the extremity of the bowel, kneeling upon a chair, the knees on the seat, the elbows resting on the back of it. He may prefer to stand by the side of a table or bed, and lean over it, in which case care must be taken that he does not raise his feet from the floor, nor bend his knees; the nates are fully separated and kept asunder by a good assistant. The operation is proceeded with differently according to circumstances. In the complete fistula, the extent of the track and the existence of an internal opening will be ascertained by previous examination with a probe in the sinus and the finger in the bowel. For the probe a narrow, slightly curved, and blunt-pointed bistoury is substituted; its point is made to meet the finger either through the natural opening or higher up, if the coats of the bowel are extensively detached. There is no great difficulty in dealing either with a



complete or blind external fistula, or in passing, if necessary, a bistoury with a properly made point through the coats of the

intestine, thinned and softened as they are to some extent in these cases. The knife and point of the finger being in contact, they are withdrawn together, and some little art is requisite in effecting this; the blunt part of the instrument is now placed in contact with the finger, by raising its handle, at the same time that the distal phalanx is bent as much as possible. The points of the finger and of the bistoury are gradually brought down to the verge, and a sawing motion is given, in order to divide the interposed part, and afford room for their exit. The point having fairly emerged, the handle is quickly pushed towards the opening of the fistula, and, at one sweep, the sphincter, bowel, and integument betwixt the finger and knife are divided. The proceeding is, in all respects, the same for the blind external fistula. The blind internal one being discovered, it is made complete by pushing a sharp-pointed bistoury into the hard swelling felt by the side of the anus, or upon the point of a probe introduced as above described; the division is completed upon the finger by the narrow, blunt-pointed knife.

Notwithstanding the most careful and dexterous management of the knife, there is a risk of the instrument breaking, in cases where the parts have been much condensed; this may happen, in any case, from the unsteadiness of the patient or imperfection of the instrument. The accident has occurred twice in my hands; once from a flaw in the blade of the bistoury, in the other case from the almost gristly state of the parts, the hip being cut up by numerous fistulæ, some of more than twenty years standing. I had provided, in this case, for the accident, which I dreaded, by having a second and stronger knife open and at hand; the broken bit was picked out of the wound by the fingers after the division had been completed. It will be always prudent for the surgeon to have at least two probe-pointed bistouries within reach in operating on difficult cases. He should endeavour, by all means, to acquire the power and facility of performing this operation with the left hand as well as the right. If he cannot do so, he must, in operating on the left side, cross his hands very awkwardly, or else place the patient

on his back on a table, and have him or her held in the position as for lithotomy; and this will not always be submitted to. The gorgets, guards, directors, concealed and sliding knives, are now, it is to be hoped, entirely and for ever thrown aside; the operation can be completed more safely and quickly by the simple method and instrument above described, and long since recommended by Pott, than after any other plan. When the operation for fistula has been completed, means are taken to prevent the coalescence and union of the recently divided surfaces. A slip of lint dipped in tepid water is carefully insinuated with the probe, the finger being placed in the bowel to ensure its proper position; this is retained by a compress and T bandage. The outer dressings may be removed within twenty-four hours, along with the bandage, and replaced by fresh ones. The immediate dressing is retained until suppuration is established. On the evening of the second or third day, some medicine may be given; the lint escapes with the evacuation from the bowels. Union cannot then take place, and it is only after the discharge has somewhat ceased and the circulation of the surface is very active, the granulations florid and firm, that there is any chance of union of any part of the surface. This is prevented by occasional examination of the wound, and separation of the surfaces with the finger or probe; no dressing need be interposed betwixt the divided surfaces after the first, if that has been perfectly applied, and retained for a sufficient period. Frequent ablution, for the sake of cleanliness and to obviate excoriation of the parts, must be resorted to, and some slightly astringent and aromatic lotion may be used occasionally, or if the discharge be profuse a piece of lint soaked in the lotion can be applied and frequently renewed; the cure will thus be completed successfully, and with less trouble and pain than by following the ordinary and old-fashioned method of dressing day after day with this and the other digestive or stimulating salve.

It may be deemed necessary, and in many cases a cure cannot otherwise be expected to take place, to divide the sphincter ani, in order as already remarked, to put the parts at rest, and thus

effect the healing of troublesome fissures on the verge, or of ulcer within it, or with the view of facilitating the contraction of some false passages, as that betwixt the bowel and vagina—recto vesical fistula; this can be done easily and without danger; and the division may be made on one or both sides; the fore-finger is introduced into the bowel, and upon it a straight, narrow, and blunt-pointed knife is slid with its side towards the finger; the edge is then turned towards the tuberosity of the ischium, and division made to a sufficient depth and through all the resisting fibres. The incision in the mesial line forwards might be dangerous if carried to any extent, that in the opposite direction would not be so, but by neither can the desired object be gained, as the fibres would be merely separated, not divided.

As a consequence of long-continued irritation at the extremity of the bowel, and straining to evacuate its contents, in consequence of injury inflicted on its coats by the passage or lodgement of indurated feculent matter or foreign bodies, or in consequence of injury inflicted during parturition, and of inflammation in any way produced, extending from the vagina, permanent induration and narrowing of the rectum is occasioned. This co-arctation is generally met with in the situation of the lower natural fold of the bowel, about four inches from the verge of the anus; it varies in extent and tightness, the size of the discharges and the difficulty of expelling them, of course in some measure keep pace with the degree of stricture. The passage is widened above, and its secretions are increased and vitiated.

Abscess not unfrequently forms by the side of the contraction, and opens into the bowel above, and occasionally it makes its way to the external surface also; a complete fistula is thus formed, leading to the dilated part. It resembles, and arises much in the same way, as the urinary fistula, from ulceration in the dilated part, or from induration, in the submucous cellular tissue, followed by the suppurative process, and caused by constant impulse upon it. The functions of the entire alimentary canal become deranged, and the patient is wasted by that, and by the constant irritation and discharge. Blood is often lost from the

hæmorrhoidal vessels during the straining, and this contributes to exhaust and lower the powers of life.

Not unfrequently, the coats of the bowel are the seat of malignant induration; the surface becomes nodulated, irregular, and very hard; from the fissures, separating the tubercles, a profuse sanious and most offensive discharge is furnished. The same symptoms accompany the contraction from this cause, but the progress of the case, to an unfavourable termination, is more rapid, and the sufferings of the patient more distressing in every respect. Collections of matter form, ulceration proceeds often at a rapid rate, and destroys the partition betwixt the bowel and the neighbouring canals. No hope of cure can be held out to the sufferer, and efforts even at temporary relief and palliation, fall short of the expectations that may be entertained of them.

The extremity of the bowel affected by malignant disease, has sometimes been made the subject of severe and bloody proceedings. If operations for malignant disease on the surface can be undertaken, very rarely indeed with any prospect of success, what is to be expected from them upon parts, where neither the extent of the actual disease nor the condition of the lymphatics can possibly be ascertained? Such interference is of a piece with that which has been most unwarrantably had recourse to in some diseases of the uterus and its appendages, and is equally to be reprobated and discouraged. Contractions are, though very rarely indeed, met with betwixt the commencement of the intestinum rectum and termination of the sigmoid flexure of the colon. It has been and is the aim and anxious desire of a certain class of practitioners, to make it appear that such contractions are of common occurrence, that their existence is readily ascertained, and that they are removable by surgical means. All sorts of derangements of the alimentary canal are by some people attributed to strictures, said to exist in the situation indicated; vitiated secretions, mucous or purulent, from the large intestine—the sequelæ of dysentery, or disease of long standing in its lining membrane, any how induced—accumulations of fæculent matter, or of flatulence, the consequences of indigestion from improper diet, and of deranged

state of the whole mucous membrane of the alimentary canal, are alike referred to and treated as the results of morbid alteration at this particularly convenient spot. Instruments are forthwith introduced, probangs and ball-probes of silver, ivory, or ebony, and these are followed up in regular order by bougies of all sorts, sizes, and longitude. Instruments have been even, it is said, passed nearly three feet, certainly more than two, into the bowels, in some of these explorations in search of organic disease; whether they were jointed or not, like the machine for sweeping chimneys, is not stated in the writings of the rectum doctors. It is no easy matter, certainly, no very pleasant duty at all events, to pass an instrument into the sigmoid flexure of the colon; the natural obstacles are considerable, the direction of the tube, the laxness of its coats, its natural folds, the relative position of the sacrum, are all opposed to the proceeding. The resistance offered by any or all of these is easily mistaken by the patient, or misrepresented by the doctor as abnormal, and a most cruel and abominable practice, is adopted and sometimes persevered in for an indefinite period, with the effect of embittering life, and of ultimately inducing, in many cases, serious and dangerous changes of structure, where none had previously existed. The simple stricture of the rectum, which is within reach, and about which there can be no mistake, yields readily to the introduction, at proper intervals, of short bougies of India-rubber. These are gradually increased in size, so as to bring the canal somewhat to its natural calibre, and it is kept in this state by the occasional employment of this instrument by the patient. The bougie is more conveniently retained,—and there is no occasion for its being worn for more than a few minutes at a time,—when it is of such a form and length, as to be received entirely within the sphincter. In complicated cases the knife must be resorted to, any tracks connected with the stricture must be divided, as already described in treating of fistula; occasionally the stricture has been made to yield to the pressure of the bougie more quickly, by notching its sharp edge with a narrow straight knife. Urgent symptoms have thus been relieved and the cure accelerated.

CHAPTER XII.

INJURIES AND DISEASES OF THE GENITO-URINARY ORGANS.

THE injuries and diseases of the male organs of generation, as being the most complicated and difficult of management, may, with propriety, be first discussed. The derangement of these as regards their functions in connexion with the secretion from the kidneys, are productive perhaps of greater misery, suffering, and danger to man, than those of any other organ or set of organs. A great many of these maladies are brought on by the carelessness of the individual, whilst many are entailed upon him, by the ignorance or rashness of those who attempt the repair of mischief, probably trifling in the first instance. It cannot be denied, and it is no less true than deplorable, that by far the greater number of grave and serious injuries of the urethra and bladder, have been inflicted by pretenders to surgical knowledge, and that a considerable number of diseases which come under the notice of surgeons, are the product of mismanagement on some previous occasion. We meet with or hear of few accidental wounds of the bladder and its connexions in comparison with those instances, in which, through ill-directed attempts to reach that viscus, the patient has perished from the injury. The prostrate has been thrust from the urethra, this gland lacerated, and the bladder detached from the bowel; this latter viscus has been extensively opened; the coats of the bladder have been unnecessarily

wounded, they have been seized and dragged down along with a stone and torn by the forceps; the pelvic fascia has been cut open, than which there can be no more fatal injury, and in innumerable instances the soft parts filling the outlet of the pelvis have been bruised and lacerated to such a degree, by the introduction of instruments in attempts to remove foreign bodies, that independently of the exhaustion of the patient's excitability, and the shock to his nervous system, he has been irretrievably shut out from all chance of survival. Then let us consider how many patients of late years have lost their lives through the exploration of the bladder, and the attempts to seize and break stones with the various lithotrites; how often the apparatus has been broken or bent in the bladder, or been entangled in the passage from it. Again, it is well ascertained, that a great many of the most intractable strictures which are met with, accompanied by disorder and alteration in the structure of the bladder and kidnies, and causing often the most agonising of all human suffering, retention of urine, have had their origin in high inflammatory excitement of the passage, brought on by the imprudent introduction of instruments during the persistence of gonorrheal discharge. Many very bad and obstinate strictures are to be traced to the laceration of the lining membrane of the urethra, by the ill-directed employment of catheters, in careless and awkward attempts to relieve patients from the pain and danger of retention; even worse consequences, if possible, follow the unwarrantable poking with cutting catheters and caustics in this tender passage.

Great and immediate danger results from injury to the urethra from without. The passage is divided along with the superimposed parts, or it may be extensively opened, or even torn across, without wound either of the integument or superficial fascia of the perineum. The latter injury is caused by blows with an obtuse body, as by a kick on the part, or by a fall astride on a beam, the urethra being thuscrushed against the resisting arch of the pubis. Occasionally the case is complicated and aggravated by solution of continuity of the bones, fracture of the rami of the pubes and ischium, or diastasis of the symphysis; the urethra or

even the bladder may be wounded by a spicula of bone; the first a dangerous occurrence, the latter an inevitably fatal one. In wounded urethra the principal danger to be dreaded and guarded against, is the infiltration of urine. When there is a free external opening, there need be no apprehension of consequences; but if it be small and indirect, or if there be reason to suppose that there is wound internally without external opening, then the practice must be prompt and decided. There will at first be profuse flow of blood from the penis, and great hæmorrhagic swelling of the perineum, probably accompanied with extravasation and dark swelling of the scrotum, hæmatocele. The patient will find, if he have unfortunately made the attempt, that he cannot pass water; if any have flowed, it will have been in small quantity, bloody, with intense pain, and smarting in the perineum. A full-sized catheter must be passed and retained; if there is difficulty experienced, and if there is reason to suppose that any urine has escaped with the blood into the cellular tissue, then a free and deep incision must be made without hesitation or delay, into the perineum in the mesial line; the catheter can then be passed, if need be, from the fore part of the canal, or an instrument with a slight curve may, if the bladder is not relieved, be introduced from the wound. No dissection or separation of parts is necessary; that has been effectually done by the effused blood.

After complete division of the urethra, the anterior part has sometimes, through carelessness and inattention, (the patient is generally more to blame than the practitioner,) been permitted to close, and the urine has thus continued to be discharged entirely through a false passage. I have more than once had occasion to remedy such an inconvenient state of a patient, by cutting down in the perineum upon the canal, and carrying a catheter onwards from the orifice into the bladder. The instrument is passed down to the obstructed part, an incision is carried from over its point, directly in the line of the raphe and through the track of the fistula; the urethra is thus opened, and the catheter passed without difficulty. Many of the cases were recent,

the injury having been inflicted not many months previously. One patient, in whom the natural course of the discharge was thus restored, had most foolishly and unaccountably submitted to the inconvenience for fifteen years. Previous to that, he had laboured under some difficulty in making water. He rode to town, and had a caustic bougie thrust into the urethra by a great advocate for that most atrocious practice. His horse stumbled with him on his return homewards, and he felt that his perineum was slightly bruised. As a consequence of the first, and probably the greater injury, and the subsequent accident, inflammatory swelling and sloughing took place. The perineum was opened late, and the cure ended by all the urine passing through fistulous apertures. I was called to him on account of retention. The urine had been latterly passed with difficulty, and after much straining through the false passages; it was loaded with quantities of viscid mucus. The perineum was freely incised, so as to reach the posterior part of the canal, where it was dilated, and at the same time the knife was carried forwards to the point of a catheter in the anterior portion. The catheter was retained for a few days; and afterwards, by occasional employment of this instrument, and of bougies, the passage was restored very much to its normal state; all the fistulous openings healed, and the induration of the perineum disappeared.

Stricture of the urethra in the most aggravated form is, without doubt, the result of injury inflicted upon the passage, either from within or from without, of laceration, or of intense inflammatory action. It does arise otherwise, from specific inflammation or gonorrhæa of long standing, probably neglected or ill-treated, and aggravated during the first stage by acrid stimulating injections, and free living; or it may be traced to irritation communicated from the neighbourhood, as from repeated attacks of hæmorrhoids or from stone in the bladder. Great excitement of the urethra, attended with discharge, and heat in making water, sometimes even followed by hernia humoralis, as swelled testicle is absurdly enough termed, arises not unfrequently in consequence of the acrimony of the urine. The secretion from the

kidnies will be found loaded with acid, or it may contain amorphous or chrystallized sediment. A continuance and frequent recurrence of such attacks may lay the foundation for disease of the urethra. All affections of the passage, whether recent or of some standing, gonorrhæa, gleet, stricture, are all aggravated by this state of the urine, and in many cases little else is required to remove all the symptoms than its correction. The introduction of bougies might thus oftentimes be avoided, and when absolutely necessary, the passage will be smoothed and the cure expedited by the employment of very simple therapeutic means.

The passage is contracted at various points, most frequently about four inches from the meatus, sometimes much nearer, and even close to it. The urethra is very frequently narrowed as it passes through the deep fascia, betwixt its sinus and the apex of the prostate. The extent of the stricture, and its tightness, will be found to depend very much upon its cause and duration. It consists of a thickening and condensation of the submucous tissue, the result of lymphatic effusion. The lining membrane, more especially behind, is somewhat thickened, vascular, and more adherent to the subjacent parts than natural; anteriorly it is plicated in a longitudinal direction. The canal behind is, moreover, dilated, sometimes to a great extent; anteriorly its calibre is diminished. The bladder is contracted and thickened in all its coats, but more especially in the muscular, as seen in the sketch, p. 381. More remarkable specimens of thickened bladder may be met with, but in this the pathological changes are well seen. In my collection there is a bladder, the muscular coat of which resembles in structure the left side of the heart rather than a bladder. The stricture in the membraneous portion, the dilatation behind, the state of the canal anterior to the contraction, the congested appearance of the mucous coat of the bladder, its diminished capacity, the enlargement of the muscles of the ureters, and in fact of the whole detrusor urinæ, are all well and clearly exhibited in the sketch referred to. The cause of these changes, the resistance to be overcome, and the means of effecting this, stand in need of no explanation; the

sketch speaks for itself, and saves a vast deal of trouble, and a great waste of words. Then, in more advanced stages of the disease, it may be expected that under the constant strain and almost unceasing exertion, some part of the machine must yield. The urethra behind the stricture, it has been said, becomes dilated, and even more remarkably than exhibited in the cuts; this furnishes a vitiated secretion, which is troublesome to the patient, and is increased after any debauch. The water lodges here and runs out incontinently, after the patient has felt satisfied that his bladder was tolerably empty, and has disposed everything accordingly. This dilated portion becomes sometimes the depository of concretions which may prove troublesome by shutting up, like a pea-valve, the opening anteriorly. Ulceration is apt to take place on the inner surface from the pressure and irritation, a few drops of urine may ooze into the submucous tissue through a trifling rent produced during a violent fit of straining, in an attempt to overcome the resistance, or abscess may form in the condensed parts towards the surface, so as to establish a communication with the dilated part of the passage, and ultimately with the exterior. The urine, after a few days, escapes more readily than heretofore, and though the patient is inconvenienced by the discharge, and by the draining of the water backwards, he is, upon the whole, much relieved; the frequent desire, the forcing and consequent evacuation of the contents of the bowel, the involuntary dribbling during the night, and after making water, all disappear for a time. The new opening contracts in some degree, the symptoms recur, and fresh abscesses and fistulæ form; or, on the other hand, the coats of the bladder yield, the lining membrane is protruded betwixt the fibres of the detrusor, and this may occur at one, or at many points, forming, as it were, a series of supplementary bladders of various capacities.

These pouches are found to contain vitiated mucus, in many cases almost puriform, their communication with the general cavity being in a measure closed. In retention they occasionally yield, and extravasation of urine takes place into the loose tissue around the bladder. These pouches or cysts may also contain

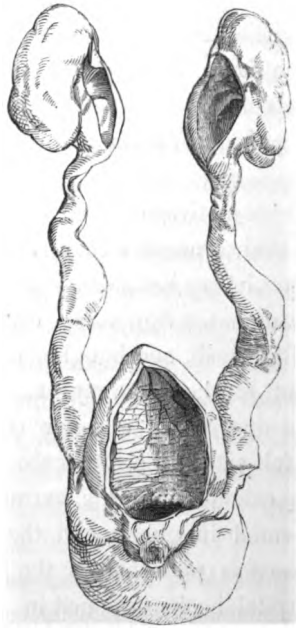
urinary concretions entire, or portions of stone, which have broken spontaneously, or have been subjected to the crushing process.

There is in my collection a specimen of a bladder, obtained from a man about eighty; the prostrate is much enlarged, there is a pretty large concretion, with a number of broken fragments, contained in the viscus, which is much sacculated, and several of the pouches contain calculi or fragments of the outer layer of one which had broken down of itself. Such preparations are neither rare nor uncommon. I was so unfortunate, some months ago, as to lose a patient after the operation of lithotrity. His urine became suppressed, and this was afterwards well accounted for by the disorganized state of the kidnies, of which, however, there was no evidence furnished. In attempts to pass a catheter, in my absence, the urethra was, it appears, torn, and the patient suffered much from the very protracted trial. A cyst in the posterior fundus of the bladder, with a smooth rounded opening barely capable of admitting the end of a common quill, contained a concretion about the size and shape of a small pea, with some sand. The cellular tissue around the cyst was softened, partly by putrefaction; the peritoneal surface being sound and unbroken at every point.

Certain parties, whose motives or feelings I care not to inquire into, evinced no less their ignorance than their malice by striving to make it appear that injury had been inflicted on the bladder by the crushing instrument. Supposing even that I happened to be the most unskilful, rash, and bungling operator in existence, and utterly ignorant of the anatomy of the parts, it is not conceivable that the opening in question could be reached, far less entered, by the full-sized lithotrite or scoop, which were used, so as to convey the calculus into the extraneous cavity. The operation was performed in public, and the parts exhibited to the pupils. The case was published in the "Lancet," and the omissions in the hospital books supplied in that work; but by some strange oversight on the part of the reporter no notice was taken of the presence of any foreign body in the cyst. It is but fair here to state, that the introduction of an instrument,

in this case, may have been attended with peculiar difficulties, in consequence of addition of bony matter, in great abundance, as more fully observed after maceration, to the ossa pubis at the symphysis on both aspects, whether the result or not of violent injury at some period cannot now be ascertained. This could not have been ascertained during life, owing to the extreme corpulency of the patient.

The ureters become dilated in cases where the difficulty of emptying the bladder is great, and where that viscus is diminished in capacity, as when containing a large calculus; the valvular arrangement at their orifice then becomes destroyed, and distension of these tubes, together with the pelves of the kidnies, and diminution of the tubular and secreting apparatus, take place to an enormous extent, in order to compensate for the contraction of the natural reservoir. These changes are here shown to have taken place in a very remarkable



manner, and in the organs of a very young subject. The boy, under three years of age, was sent to the Edinburgh Hospital, by my

friend Dr. Trail of Arbroath, and placed under my care. He was supposed to labour under calculus vesicæ. It had been necessary to draw off the child's water for some time, and a stone was, it is supposed, detected. It is barely possible that the presence of a foreign body had been the cause of all the sufferings and of the alterations in the form and structure, which led to the fatal termination. I sounded the patient most carefully and repeatedly, and could detect no foreign body. The calculus may have been small and may have passed off in the interval betwixt his examination in the country and in the hospital, though it is doubtful, in the paralysed state of the bladder, if that could have occurred. The bladder had become greatly distended, from some cause, and must have remained so for many days before assistance was procured. There can be no more complete exemplification of what has been advanced in regard to the yielding of the coats of the bladder and ureters, than the one given here. A cyst from the side of the bladder, with a rounded and narrow opening, is also seen in the sketch, p. 383. The bladder, in that instance, had regained its normal condition, both as regards the thickness of the coats and its capacity; but such a material alteration as this diverticulum could not be expected to disappear at any time, even after the removal of the cause.

The existence of slight stricture may be suspected from the liability to discharge of vitiated mucus from the urethra, from the venereal appetite and power being diminished, from chronic swelling of the testes, or from frequency in making water and scattering of the stream. The more confirmed and tight contractions give rise to difficult micturition, increased by any excitement of the system or derangement of the digestive organs. The state of the urinary secretion influences the symptoms very materially; the lining membrane is irritated and congested, and the muscles surrounding the bulb and the membranous portion of the canal are often spasmodically affected by the passing of the acrimonious fluid along it. Complete retention is thus often brought on. The resistance offered by the stricture is overcome so far by the more fully developed detrusor; but, in addition to

that, the assistance of the levator ani, together with the abdominal muscles, is constantly required. Great pressure and straining are demanded, and the contents of the intestinal canal are often evacuated at the same time, to the great inconvenience of the patient. The water flows in a very small and scattered stream, and, at first, is occasionally voided only by drops. The mucous surface of the whole of the passages, ureters, bladders, and posterior part of the urethra, furnish a great quantity of vitiated discharge, which subsides from the urine in cooling, and often composes half of what is evacuated. It is tenacious, and often exhales an offensive and peculiar odour. This secretion is constantly observed more or less in the various diseases of the urinary organs, stricture, stone, enlarged prostate, especially when any fresh impulse is given them, when a change in the nature of the urine is caused by irregular living, when a fit of stone is any how induced, or when, from neglect, accumulation in the bladder is allowed to take place to a considerable extent. The secretion is poured out as in other situations, to sheath and protect the surface ; and it is not, certainly, unless under very unusual circumstances, a source of irritation, as supposed by a late writer on the subject.

The sympathies and functions of the parts are completely subverted by stricture. At times the urine is passed with the utmost difficulty and after great exertion; at other times, as during the night, it often passes off involuntarily. The patient's health suffers materially from pain, want of rest, and the wasting catarrhal discharge, his countenance becomes sallow and anxious, his nervous system is excited, he is irritable and peevish, and often labours under weakness of his loins and lower limbs; pain and gouty swellings of the feet, ancles, and knees, often enough add to his sufferings.

The bladder in stricture is incapable of containing any great quantity of fluid, and if through any chance its escape is completely arrested, the most intense and lively suffering is immediately occasioned, the patient becomes alarmed and anxious, and his efforts to procure an evacuation are incessant. Violent pain

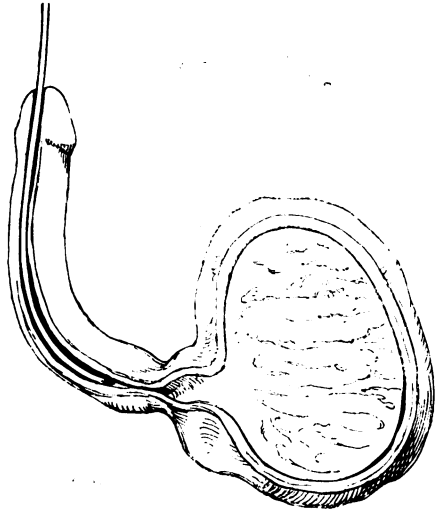
is felt in the hypogastrium, aggravated by pressure, his pulse is accelerated, copious perspiration breaks out, the patient becomes delirious, and in the end comatose. During the violent efforts perhaps sudden relief is felt; the urine does not pass, however. Pain and smarting, attended by swelling, is felt near the anus, this is speedily followed by enlargement of the penis and scrotum; the dilated part behind the stricture has yielded, and the urine has escaped into the cellular tissue; this again will be followed by rapid sloughing, not only of the deeper parts, but also of the external coverings if instant relief is not afforded, and the patient will be fortunate if his constitution bear up under the local irritation and wasting discharge, which must be induced. Wonderful recoveries are occasionally made even after careless management in the first instance, and the successful efforts of nature in affording a new covering to the testes cannot be sufficiently admired. The cicatrization is often slow for some time, but after it has reached the convexity of the glands, it is remarkable how rapidly the parts are drawn within the integument, which is borrowed from the perineum and surrounding parts.

By attention to the digestive organs, correcting the secretion of urine if necessary, and diminishing still further the irritability of the canal, for which a few gentle introductions of a bougie at considerable intervals is found to suffice, the patient will generally be relieved of the uneasy symptoms caused by ordinary strictures. A painful burning sensation is experienced, in passing the bougie through the naturally narrow points of urethra for the first few times, and some few drops of blood may perhaps follow the first operation; but by allowing ample time to elapse betwixt these, all uneasy feelings will disappear; the patient will no longer suffer uneasiness, nor feel faint and sick whilst under the surgeon's hands, and the discharge of urine, so soon as the immediate effects of the introduction have ceased, the tenderness and slight swelling, will be found very much relieved. The irritability and increased vascularity of the lining membrane will all abate, as is seen in other membranes of similar nature; as for instance, when the lining of the prepuce and glans are exposed from time to

time; here at first the slightest touch gives rise to great suffering, but this extreme susceptibility soon diminishes by occasional exposure and contact. The introduction of a bougie must be uniformly performed with the greatest care and gentleness; the patient may be placed erect or recumbent; if alarmed or disposed to become at all faint, if he have on any occasion felt this sensation, (and with some, this peculiarity is continued in defiance of frequent practice,) the latter position is of course adopted. A small silver catheter is the preferable instrument if there is reason to suppose that the contraction is considerable, if not, a plated metal bougie of moderate size, slightly curved throughout and smeared with some bland liniment, may be used. These are much superior in all respects to the plaster, gum, or other soft and pliable bougies. There is no possibility of guiding their points or of ascertaining what direction they take. The point of the instrument is entered into the meatus and gradually insinuated along the spongy part of the passage. The canal is not stretched; in fact, the organ should not even be touched or interfered with at all, by the left hand, during any part of the operation. The passage is thus left more free, the muscles surrounding it are off their guard, and the natural obstacles much more readily evaded. The point of the instrument is slid without the slightest force, and with scarcely appreciable uneasiness, along the upper surface of the canal, to that part of it embraced by the layers of the deep fascia and some interposed muscular fibres; the handle is then depressed gently, and the point still kept in contact with the upper or anterior surface is slipped into the bladder. This operation may be repeated at an interval of four or five days, when the smarting shall have ceased and the stream of urine begun to improve. Then after the original bougie has been introduced and withdrawn, a second, perhaps a size or two larger, will be found to pass even more readily than the first, with less pain and less consequent resistance from the muscles surrounding the passage. It is from their action that the natural obstacles, and perhaps the greater narrowness of the canal at the points already indicated, are occasioned. This

plan is persevered in until an instrument which fills the orifice, the tightest part of the whole canal, passes along without obstruction. The orifice of the urethra is the best measure of a full-sized bougie for each individual. If these rules be attended to, there will be but slight risk of a return of the symptoms, unless fresh causes be applied.

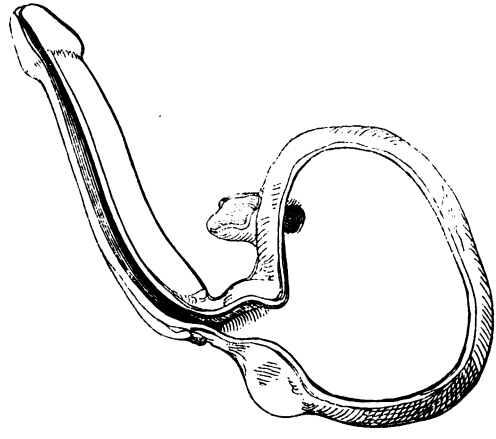
In the management of very badly strictured urethra, where small instruments must of necessity be used, the utmost caution, patience, and perseverance, are demanded from the surgeon, together with a full and lively recollection of the anatomical relations of parts, and their pathological condition. Lightness of hand, and gentleness of manipulation, will often enable him to overcome difficulties which to others, perhaps, have proved insuperable. The operation of introducing a catheter, through what has been called an impermeable stricture, is without doubt the most difficult in the whole range of surgical operations, and demands all the prudence, science, and skill of a master. The art can only be acquired, and that gradually, by frequent practice. If the contraction is placed before the scrotum, and if it is very gristly, tight, and unyielding, it may be necessary to lay hold of the hard part betwixt the finger and thumb of the left



hand, whilst the point of the instrument is gently insinuated through it; then it is shaken along, as it were, in the dilated passage beyond. Another obstacle will probably present, and this is to be encountered and surmounted methodically and without hurry.

On the last page the catheter is represented as passed to the stricture, and its point insinuated so far within it. This fact can be ascertained by gently attempting to withdraw the instrument, when it will be found grasped and held firmly. By gentle and persevering pressure, the contraction of the fibres surrounding the part yields, and the instrument slips on into the dilated part behind, and can from thence be passed on to the bladder. The forefinger in the bowel may sometimes serve as a guide, but this is not often required; gradual and steady persistance, without force, will generally enable the surgeon to overcome all difficulties, and to lodge the instrument in the bladder, through the natural passage, without laceration to the slightest extent, even of the lining membrane. If the operation has been performed on account of retention, or if that has been threatened,—and it is very apt to follow the swelling which always supervenes more or less upon the use of an instrument,—it may be prudent to retain the catheter. This is a very efficient, safe, and quick method of freeing the patient of bad stricture. It matters not how small the foreign body may be, nature sets about a process to free herself of it; the passage is widened remarkably, and a most profuse discharge is set up, so that within forty-eight hours the instrument which had been grasped most tightly, lies now quite loose, and the urine flows along it; it may be withdrawn, and a large-sized bougie immediately substituted without difficulty. This is the only safe way of taking advantage of what has been called vital dilatation of the passage. The securing of a bougie in the urethra, merely in contact with the stricture, for days and weeks, must appear a very futile and unsurgical proceeding, one certainly not likely to be very often called for in the practice of a man with hands to act and a head to guide them. The catheter well made, properly tempered, and of silver, is alone applicable, in cases of stricture,

really requiring its being retained in the bladder; means must be taken to preserve its position. The simplest and best apparatus consists of a band round the waist, and a couple of strips of oiled silk. These are carried from the rings of the catheter, passed behind the thighs, and secured to the circular band on the lateral aspects, by both ends. The instrument should not be retained more than two days; otherwise the openings get closed by calculous deposit. Within three days after its withdrawal, the state of the canal should be ascertained, and a catheter of moderate size carried on to the bladder; after that, longer intervals may be observed, and the size gradually increased. Thus the worst possible stricture may be got the better of, and the patient completely restored to health, if indeed the kidnies have not suffered materially. The urethra becomes again of its normal dimensions, and all the dilatations disappear in a great measure: the bladder becomes thinned in its coats, the necessity for powerful action no longer existing. It is also increased in capacity; all this is demonstrated in the specimen here delineated.



The patient from whom it was obtained had for twenty years or more laboured under very bad stricture of the urethra, with

prolapsus recti dependent upon it; he passed his water almost every hour with great straining, and at night it dribbled away involuntarily. The strictures, one opposite the accelerator, and the other behind the sinus, were exceedingly tight; they were gradually dilated and, in a great degree, removed, the patient having an objection to any very large instruments being introduced. Nos. 7 and 8 were got to pass easily; he was completely relieved of all his uneasiness, could hold his water nearly all night, and recovered the other functions of the parts very perfectly. He was carried off by internal disease unconnected with the urinary organs. The bladder, which must have been at one period much contracted and thickened, is seen to be capacious, and its coats of normal appearance, excepting the protrusion of the lining membrane at one point, forming a very pretty cyst which had probably existed for a great many years. The dilatations of the urethra behind the strictured parts, not altogether reduced to the calibre of the rest of the canal, are also still remarkable. The organs were upon the whole comparatively healthy, and they might have continued serviceable for many years without further surgical interference.

Retention of urine must be treated with reference to the cause which has produced it, the nature and situation of the obstacle, and the state of the bladder. The circumstances following upon injuries of the perineum, the nature of stricture, the contracted condition and great strength of the bladder in such cases, together with the symptoms attendant upon accumulation in it, have already been shortly described. The peculiarities of retention, arising from loss of tone of the organ, or from paralysis of the detrusor consequent upon over distension, and occurring, as it generally does, in connexion with hypertrophy of the prostate gland, require some notice. Inflammation and abscess of this gland and malignant degeneration of its structure, diseases most fortunately of rare occurrence, give rise to great disturbance in the functions of the bladder. The simple enlargement of the gland often attains considerable volume without causing any great annoyance. It is at an advanced period of life that this affection is met with, though it is by no means an invariable occurrence.

In many old men the gland preserves its normal form, and presents no greater bulk than at puberty. The swelling of the prostate in some instances gives rise to a feeling of weight in the perineum, with uneasiness on going to stool, and slightly painful sensations at the point of the penis after micturition; this latter function is perhaps more frequently performed than usual before the enlargement. If a patient so affected be careless about emptying his bladder, accumulation gradually takes place; a certain quantity of water, much more than natural, always remains behind, perhaps amounting to a pint or more; a certain quantity is evacuated on the call being made and by voluntary efforts; the secretion is mixed with those from the coats of the bladder, and these become more and more vitiated; the bladder comes at last, as is well observed by Sir B. Brodie, in his excellent work, to resemble a badly-washed chamber utensil. After some slight debauch, neglect of the first impulse to make water, or from exposure to cold, a complete stoppage takes place; the symptoms are by far less urgent than those already described as accompanying stricture. The coats of the bladder bear distension to a great extent; many hours, and even some days, are allowed to pass over before assistance is requested. The water has perhaps begun to dribble off involuntarily, or is passed in small quantity by the efforts of the patient, by muscular action, and pressure on the hypogastrium. In these cases the bladder will be felt distinctly as a large ovoid tumour, rising towards the umbilicus, and fluctuation may even be perceived when the abdominal parietes are not much loaded with fat. At first the dilatation of the posterior fundus takes place towards the hollow of the sacrum, as in the normal state; then the upper fundus is expanded, and the whole viscus, after a certain degree of distension, rises *en masse*, like the gravid uterus, into the abdominal cavity. The length of the urethra is much increased by the elongation of the prostatic portion, but by this displacement the distance is still further increased from the arch of the pubes to the cavity of the bladder. In the first instance the retention is very complete, the posterior part of the gland, which is enlarged and prominent, being forced

forwards by the pressure of the fluid, so as to adapt itself like a valve to the commencement of the urethra, but, as already remarked, this obstacle is so far removed, and after a few days the urine runs off involuntarily,—the bladder runs over as it were. But there is always a risk of the coats giving way by sloughing, or of the urine being extravasated in consequence of the lining membrane (be it observed these have no muscular coat) of one of the cysts yielding, perhaps only in a slight degree. The extravasation within the pelvic fascia, an inevitably fatal accident, is, however, of comparatively rare occurrence.

The management of lacerated urethra has been noticed; should the opportunity of passing a catheter before the patient has attempted to evacuate his bladder have been neglected, and swelling from infiltration and inflammatory action have supervened, and should the bladder be much distended, and relief not follow the free incision of the perineum; still further, should it be found impossible to reach that viscus by the natural passage, and through that part of the urethra behind the solution of continuity, then the only course that can be pursued is to puncture the bladder. If circumstances do not contra-indicate it, the opening should be made through the rectum in the *trigone*. Retention of urine, arising from inflammation of the urethra, aggravated perhaps by hard living, or other imprudent conduct, the parts being previously in a healthy and undisturbed state, may often be relieved by active antiphlogistic means, if the patient is seen before the distension becomes very great; blood is taken from the arm, the perineum is freely leeched or cupped, warm-baths and enemata resorted to, and opium exhibited by the mouth and anus; but the urgency and duration of the symptoms may forbid long perseverance in these means; delay is always dangerous, and although the patient may suffer considerably from the operation, recourse must oftentimes be had to the catheter in such cases.

The mode of using the instrument in strictured urethra has already been described; in cases of retention from this cause the difficulty is often considerably less than when the operation is performed with the view of removing the contraction; the blad-

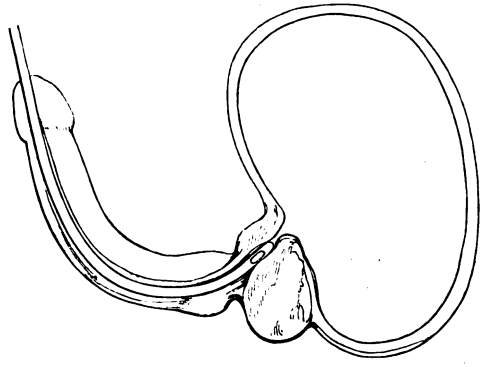
der and posterior part of the canal being at that time undistended. The delay of a few hours after the accession of the symptoms is here generally inadmissible. The state of parts must be adverted to, the tremendous power of the bladder, and the altered and unsound state of the canal behind the stricture. There is no possibility of reckoning how long the latter part will resist the constant impulse upon it, and let it be recollected that the urine escapes into the perineum either by a gradual process, the formation of abscess, or by the sudden giving way of the lining membrane of the dilated part. In the former case the cellular tissue is condensed, and the discharge of urine often does not take place for some days after the abscess has been emptied, naturally or artificially; in the latter case the cellular tissue is comparatively unaffected; it is pervious in all directions, and the fluid, dark in colour, containing a great quantity of saline matter, and much more acrid by its retention, is immediately extravasated all around, even into the groins and lower part of the abdominal parietes under the loose cellular fascia; occasionally the case is somewhat complicated; perineal abscess has been in progress, has in some measure, perhaps by its pressure, been the cause of the retention; the urine escapes in quantity into the cyst of the abscess, which it distends suddenly and enormously; the parietes of this may, in their turn, give way, and thus permit in addition urinous infiltration. The local effects have been formerly noticed; the constitutional disturbance is always alarming; the patient is often prostrated at once, and perishes in a very short time, as if poisoned by the absorption of the irritating fluid; others, again, struggle on, labouring under great depression of the powers of life, with cold extremities, hiccough, disturbed stomach and bowels, confusion of intellect, and drowsiness; they may thus perish after a time, great part of the cellular tissue and skin having sloughed; but by energetic, local, and general means, even in very desperate circumstances, many may be saved from destruction. In all cases of retention, when there is reason to suppose that the urethra has been previously diseased, the state of the perineum must be carefully ascertained; this is the first step to be taken; the pre-

sence of matter is here indicated by hard, deep-seated, painful swelling, and even where a great quantity of fluid, and putrid pus, and urine, are confined, there is often but little bulging out externally. In cases of neglected and chronic abscess in this situation, the skin is sometimes found discoloured; the tumour is apparent, and fluctuation even may be felt; but the patient must have been sadly neglected, and the treatment, if the abscess is acute, conducted in a disgraceful way, where such a state of matters is allowed to occur under the eyes of a practitioner. The arrangement of the superficial fascia, which long resists the progress of fluid to the surface, must be kept in view, and the presence of deep, hard, and painful swelling, coupled with the previous history of the case, the derangement in the functions of the urinary organs, looked upon as a sufficient warrant for making a free incision; very often nothing more will be required in order to afford relief from all the urgent and alarming symptoms. In cases of extravasation with or without a deposit of putrid stuff under the perineal fascia, very free incision must be instantly resorted to; it will not be sufficient to make some trifling punctures here and there in the skin of the penis or scrotum; the perineum must be exposed fully by separating the thighs, and an incision made, two inches long at least, in the mesial line, and to a considerable depth. If the cellular tissue is much loaded, the bistoury must sometimes be made to penetrate an inch and a-half or more before relief is afforded. The bladder will thus also be relieved at once, and there will be no occasion in general to introduce a catheter either along the canal or through the perineal opening. At an after period of the case means will be taken as a matter of course to clear the urethra and favour the healing of the false possages, so as to restore the whole genito-urinary system as much as possible to its normal state.

Should a case of retention present, in which it is found impossible to penetrate the strictured part of the urethra with the catheter, and there is no abscess, the proper practice will be to make a free opening in the perineum directly upon the obstructed part, to cut upon the end of the catheter, to carry the

knife forwards, open the dilated part, and then pass the tube on to the bladder. This is preferable to the puncture of the parietes of the bladder in any situation; but the case requiring that alternative, must be rare indeed if the mode of using a catheter is well and properly understood.

Retention, when the prostate is enlarged, can in general be readily relieved if a proper instrument be used; in many such cases, the bladder cannot possibly be reached with those of ordinary length. The prostate catheter should be made of silver, and at least three inches longer than those employed for other purposes; the beak should be long, and the curve considerably greater. The careful employment of such an instrument



will generally be followed by a successful result, whereas attempts with short and elastic catheters must almost certainly end in disappointment to the practitioner and great injury to the patient. Innumerable cases have been presented to me in which, for days, persevering attempts have been made to relieve an over-distended bladder; nothing but blood, and that in abundance, has flowed. It has then been imagined that the bladder was full of blood, and means have been employed, such as exhausting syringes and injections of warm water, to break down and extract the coagula supposed to exist. A long catheter has been at last used with the effect of freeing the bladder of many pounds of high-coloured urine, but nothing else. Accumulations of blood in the bladder from fungous growth or other cause, are for-

tunately not of common occurrence. Should it so happen that great opposition is offered to the introduction of the catheter through the gland, it is generally the posterior and prominent part that comes in the way. It will remain for the surgeon to determine whether he will attempt to reach the cavity by puncture through the natural passage, or by tapping above the pubes. The puncture by the rectum is here inadmissible from the anatomical relations of the parts in their altered state. It cannot be effected without either penetrating the gland with the risk of not reaching the cavity, as has happened more than once within my knowledge, or running the risk of wounding the duplicature of the peritoneum, which lies in close contact with its posterior border, when in a state of hypertrophy. The puncture above the pubes is always attended with great danger from infiltration, which it is difficult to guard against, or from peritoneal inflammation, to which the parts in this state of matters are liable. The projecting part of the gland can be readily perforated, and without hazard. It is better to do so with a stilette, carried through a slightly-curved and long canula, the point of which, by examination through the rectum, is ascertained to be fairly and deeply lodged in the prostatic portion of the urethra, than by the catheter. The point of the canula will of course be filled up by a rounded point during its introduction; this is withdrawn, and the stilette substituted. I have practised this operation a few times successfully, but a dexterous use of the catheter will render recourse to such a proceeding seldom necessary. If the patient cannot be relieved by the gentle and well-directed use of the catheter, he must not be left to his fate, and the mode here indicated is the safest that can be pursued.

The punctures of the bladder are operations unattended with difficulty, though fraught with danger; many are the victims that have been bungled out of their lives by the injudicious and awkward use of catheters, and by the ill-timed and imprudent recourse to perforation of the bladder. Cases have come within my observation in which the bladder has been thrust for again and again from above the pubes, after the viscus, previously of

small capacity, had emptied itself into the cellular tissue, and become thoroughly collapsed. Some of the errors which have been committed in attempts to reach the bladder from the rectum in unsuitable cases, have been alluded to. These operations have been, and are still, much more frequently performed than there is any occasion for. I have, as yet, met with but one case in private, and that a very peculiar one, in which the opening of the viscus seemed indispensable. Here, however, there was no difficulty in introducing a full-sized catheter; in fact, for some weeks the urine had been drawn off regularly twice or three times a-day by one of my private pupils. A slow inflammation of the bladder, however, had supervened, as is often the case in consequence of injury of the spine. The cavity became much distended with muco-purulent fluid, which could not be drawn off through the urethra; an opening was made above the pubes of sufficient size to admit the finger; the ordinary puncture, with a trocar and canula, would, it was supposed, have answered no better purpose than the introduction of a large catheter, with full-sized eyes. A quantity of thick matter was evacuated, together with a membrane, whether the mucous lining detached, or an adventitious formation, appears doubtful. The membrane and bladder, obtained some months afterwards, are preserved in my collection.

The puncture from the rectum can be performed without injuring important parts when the prostate is sound. The canula of a curved trocar is guided by the finger to the triangular space, bounded by the vesiculæ and peritoneum, the stilette is then protruded, and the whole instrument pushed forwards into the posterior fundus of the organ. The canula is retained for a certain time, until the cause for the proceeding is got rid of, or the operation may be repeated as occasion demands.

When the bladder has risen high into the abdomen, together with its peritoneal covering, the puncture above the pubes can be effected by a previous simple division of the skin and separation of the recti and pyramidales. A straight long trocar is used for the purpose of perforating the bladder; care must be taken to retain

the canula, and, by position of the patient, infiltration may, perhaps, be guarded against. Patients have, now and then, lived after these operations, but the chances in their favour are few, compared to those afforded by the withdrawal of the fluid, properly and without lesion, through the natural passages. The operation of puncturing the bladder in any way was not once performed in a series of years during which I filled the offices of assistant surgeon and surgeon to the Royal Infirmary of Edinburgh: and it has been performed but once, and that before I joined it, at the North London, now named University College, Hospital, since it was opened. The cases of bad urinary disease at these institutions during this period have not been few.

Fistulous openings communicating with the urinary passage almost uniformly close after the removal of their cause, upon the restoration of the canal throughout to its natural calibre. The frequent introduction of instruments, or the long retention of them, will rather tend to aggravate the disease than otherwise. The retention of a catheter for many days or weeks is scarcely advisable under any circumstances; abscess is apt to form in the course of the canal, portions of it are destroyed by ulceration, and some of the most untractable openings, those anterior to the scrotum, I have known to be thus occasioned. The occasional use of a bougie, and the gradual expansion of the urethra to its proper size, is the first step to be adopted with the view of ridding the patient of the inconvenience attendant upon the discharge of urine through the scrotum, perineum, or rectum. Should the track still remain pervious, the use of bougies being for a considerable time discontinued, the urethra being clear, and the patient's health being, besides, perfectly good, some means must be adopted to cause contraction. If there has been little or no loss of substance, the application of a heated wire will be found the most simple and manageable plan. A speculum, of course, should be used, in order to bring the aperture of the fistula into view when it is situated within the sphincter of the anus. The application is made, if possible, through the whole track, and effectually, so as to cause a thin

slough; great destruction of tissue is not desirable. The good effects will not be felt, probably, for a great many weeks; in the first instance, in fact, after the separation of the slough, the passage is widened and the flow of urine is even more profuse than before. The amendment is gradual as the contraction and cicatrization proceed. A second application, but of a smaller wire, may be required, if, after a certain period, the dribbling has not ceased entirely. Great difficulty will be experienced in procuring union, in attempts to cover over these openings by any paring of their edges, or incisions, or turning over of flaps. It is next to an impossiblity to prevent the oozing of a little urine; this will, in fact, take place shortly after the introduction of the most full-sized catheter, and by its sides. It is quite impossible to prevent the escape of discharge from the lining membrane of the passage; besides, a flap of integument only is rather apt to lose its vitality, however carefully it is made and however broad its attachment. In some extreme cases an attempt may be made in this region to repair the loss of substance in one part by borrowing from another; but the surgeon and patient must not be over sanguine as to the result, and must be prepared to meet with disappointment.

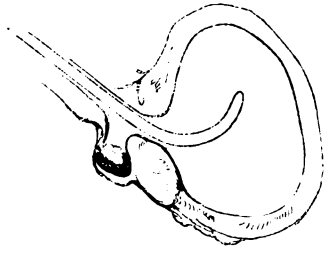
Wounds of the bladder within the peritoneal sac, or even behind the reflection of the pelvic fascia, are almost inevitably mortal; they may be inflicted from without by pointed weapons; from without or within, as in rash and ill-conducted operations for stone; or, again, they may be the result of violent injury and solution of continuity in the bones of the pelvis. I have seen some accidental wounds of this viscus from which patients have recovered very favourably. Wound of the posterior fundus, through the rectum, if it does not pass beyond the bladder, is not necessarily attended with great risk. Foreign bodies, as bullets, have entered the viscus at various parts; the immediate effects have been recovered from, and their removal has, after a time, been accomplished by incision of the perineum. Foreign bodies have also occasionally been introduced through the urethra and retained in the cavity of the bladder. Bougies have

slipped in, portions of these or of catheters have broken off in the cavity or canal, and from thence have been carried back, by an inverted action of the passage, similar to the antiperistaltic motion of the intestinal tube. Various cases are recorded in which foreign bodies of one kind and another have been introduced heedlessly, or through some morbid feeling of the patient, into the bladder, more especially in females. The instances are rare in the male, in consequence of the length and sensibility of the canal, and the difficulty in effecting the object; yet, occasionally, foreign bodies are found, as the nuclei of urinary concretions in the male.

A case is related in the "Edinburgh Medical and Surgical Journal," vol. xxxi. p. 229, of an old man, who was treated by me, in the Royal Infirmary, for stone; it was ascertained, by sounding, to be small and soft. The operation of lithotrity, then (1828) not by any means very perfect or safe, was performed, and proved quite successful. In fact, it is the first case in which lithotrity succeeded in this country, and long before the invasion of the professed stone-grinders. This stone had, as a nucleus, a number of seeds of barley, with part of the beards. Some thirteen or fourteen were extracted entire, together with the detritus of a calculus which had surrounded and bound them together. The patient, an old man above seventy, confessed that, whilst employed in assisting the reapers during harvest, he had thoughtlessly passed the barley pickles into the urethra, one after another, holding them by the beards; he had almost forgotten the circumstance, thinking that they might have passed off with the urine, until the symptoms became troublesome. Strange to say, he did not apply until months after the occurrence, when the crystallized deposit had become pretty abundant, so as to cover completely the foreign matter.

In the most healthy individual the presence of any foreign body will give rise to the deposit of calculous matter. In some, it takes place, as is well known, more readily than in others, and more quickly at some periods in the same individual. Much depends upon the state of the digestive organs, and

the consequent quality of the secretion from the kidneys. Deposits of various kinds take place from the urine, if abundant and crystallized, portions may be retained in the kidneys and bladder. In this latter situation, their existence may be ascertained by sensible signs. The symptoms and external signs which induce and warrant an examination through the urethra, are pain at the point of the penis, after micturition, and sudden stoppage of the stream; in addition, the urine will probably be passed more frequently than it used to be before the accession of pain; the desire to do so will be more sudden and urgent. There will often be observed some cloudiness, some thick, white deposit in the bottom of the vessel when the fluid cools. The symptoms are generally found to be aggravated, after motion in a carriage, or on horseback, and some blood will then probably appear mixed with the urine. As the stone attains volume, other uneasy feelings are complained of, as weight in the perineum, and pain in the sole of the foot. The history of the case should be inquired into, as regards the feelings about the region of the kidneys, which preceded the disturbance in the functions of the bladder; the period and mode of their accession should also be distinctly made out; the existing state of the secretion it is also highly necessary to ascertain, so that as far as possible an opinion may be formed of the condition of the secreting organs. The specific gravity, existence or not of albumen, &c., must be attended to. The concretion is sometimes fixed in the extremity of the ureter, though rarely, in a cyst of the lining membrane, or in a cavity in the neck of the bladder an enlarged prostatic duct. A calculus, here represented, is lodged



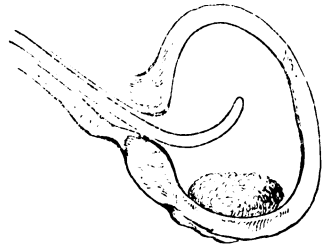
in a cyst, close to the apex of the prostate: in some circumstances this might be touched with an instrument, instead of being passed over, as shown here. The presence of a stone here may co-exist with one or more in the bladder. It has happened, again and again, that the latter have been overlooked, and a second operation has thus been required for the patient's relief. Almost uniformly the stone is loose, and when the patient is recumbent, it lies in the posterior fundus of the bladder. It falls upon the anterior surface when the patient stoops forward, as in making water, and then frequently acts as a valve upon the outlet. The severity of the symptoms will depend much upon the size, form, surface, and number (for there is no limit in this respect) of the foreign bodies. The suffering may have been for a time almost unbearable, and then ceases in a great measure. Again, the concretion which had been smoothly polished on its surface, and water-worn, is increased rapidly, in consequence probably of change in the mode of life, and disordered digestion; the deposit consists of sharp and angular crystals, and all the uneasy feelings are renewed with redoubled violence.

The operation of sounding must be conducted with very great care and deliberation. It ought to be done at once effectually but at the same time with extreme gentleness, so as to ascertain with certainty the existence or not of stone, and all the circumstances connected with it; whether or not it is single, what its size, and whether rough or smooth on the surface. The consistence may even be guessed at by the sound emitted when it is struck smartly. The surgeon must first of all be perfectly satisfied that there is really a stone in the bladder, for many mistakes have been committed in this respect, and even by those who have been long engaged in practice. The symptoms, it is well known, of stone in the bladder, may all be simulated in cases of diseased kidney, or from gastric irritation in children, connected or not with teething. The presence of sordes or of worms in the intestinal canal in young subjects, frequently gives rise to almost every symptom of stone in the bladder. A careless mode of sounding, and inattentive observation of the signs thus ob-

tained, have too often led to error in diagnosis, and the performance of unnecessary operations. In the first place, such patients should not be sounded at all. If there is any suspicion of diseased kidney, or of derangement of the digestive organs, existing to a considerable extent, these should be attended to in the first instance, and if the symptoms do not yield, and gradually disappear, then further inquiry and examination should be made. The rubbing of the point of the sound over the fasciculi of the bladder, or the grating on sand entangled in mucosity, must, in some of these cases, have been mistaken for the sensation communicated by a calculus; in other instances it is reasonable to suppose that a small calculus has actually existed in the bladder, has been struck with a sound, and has afterwards become encysted, or has escaped in the interval betwixt the sounding and incisions. The surgeon must not be satisfied with a mere rub on something hard; he will, if duly impressed with the necessity for caution and accuracy in this proceeding, satisfy himself that he can pass his instrument on all sides, and not only feel distinctly that the instrument is in contact with a foreign body, but he must make himself perfectly certain besides that he hears the stroke of the sound upon it.

In order to discover a stone most readily, the bladder should contain a certain quantity of fluid, neither too much nor too little, say from five to eight ounces; as much, in fact, as will fill the posterior fundus. If the patient has not emptied his bladder for an hour or two, the sound may at once be introduced. If the bladder has been emptied, or if there is difficulty felt in exploring the cavity, then a sufficient quantity of tepid water should be injected through a catheter with a properly adapted syringe or gum-bottle. The patient is laid in the recumbent position, with the pelvis somewhat raised, on a couch of a convenient height. The silver catheter with a short and sudden curve is sometimes used for sounding, but it is better to withdraw this if it has been introduced for the purpose of injecting the bladder, and substitute a solid steel sound of the same shape. The posterior fundus can be better examined with a short beaked instru-

ment than with the old fashioned long curved sound. The surgeon places himself on the right side of the patient, he enters the sound, warmed and smeared with liniment, into the passage with the convexity towards the left groin; he passes it down to the sinus of the urethra, gradually turns the point towards the triangular ligament, bearing along the upper surface of the canal, and then, by depressing the handle and pushing the instrument upwards in the axis of the bladder, he reaches the cavity. After a slight pause to quiet and reassure the patient, he proceeds methodically to examine into the state of matters. He may in all probability at once strike the stone, feel and hear it without difficulty; this is likely to be the case if it is of considerable size, but if small, some care and dexterity in the manipulation will be required to detect it. Each side of the posterior cavity is examined by turning the sound and carrying it by gentle motions from the borders of the prostate to behind the entrance of the ureter. The point of the instrument can, by depressing the handle, be turned from one side to the other so as to sweep thoroughly the fundus; should nothing still be felt, the history being perfectly satisfactory, the patient having suffered at least many months under the symptoms, and these being strong and well marked, it may be advisable, in order to be in a condition to give a decided opinion, to change the attitude of the patient, to make him get into the erect position, to stoop forward considerably, and to strain as if to empty the bladder. Moreover it may be proper also, to withdraw the sound and to introduce a catheter to empty the bladder. The stone, if one exists, will probably drop upon the instrument and then be felt distinctly. Should the symptoms persist and no other cause be suspected or discovered to account for them, a second careful examination may be instituted; if stone is discovered, an estimate must be formed of its size, in order, by taking this and the condition of



the parts into consideration, that a proper decision may be formed, under all the circumstances, as to the most safe proceeding for its removal. Until within the last twenty years, the surgeon or patient had no choice as to the mode of effecting a cure of stone; there was a choice certainly as to where the incisions should be made, whether above, before, or behind,—but the stone had to be cut out somehow—there was in this respect no alternative. Many sufferers under the disease had bethought themselves of means to remove the foreign body entire or piecemeal through the natural passage, and some surgeons had also turned their attention to the subject. The cases of the monk of Citeaux and of Col. Martin, both of whom chipped off bits of stone by a wire passed along the urethra, are well known. Very imperfect instruments had been imagined for entangling and cracking the stone, but never applied.

Sir Astley Cooper, in the year 1820, feeling anxious to save a patient who applied to him, suffering from the presence of a number of small stones, the pain and danger attendant upon the operation of lithotomy, employed Mr. Weiss, sen. to make for him a pair of slender bent forceps, which he could introduce along the urethra; this instrument, at first rude enough, answered the purpose so far. It was afterwards through Mr. Weiss' ingenuity and perseverance made very perfect, and by means of it many concretions were removed from different patients by Sir Astley Cooper, Sir Benjamin Brodie, and other surgeons. After having had the clumsy ivory handle taken off those I obtained, and smooth metal ones substituted, I used these instruments very successfully in a variety of cases, and in patients of all ages. This method, not very often applicable, and liable to many objections besides, such as the risk of entanglement, of laceration of the urethra, of slipping the stone in the passage, is in a great measure superseded by the lithotrite, as now perfected and rendered so safe and generally useful.

Being led to turn over the subject in his mind, it appears that so early as 1821, Mr. Weiss had also contemplated the possibility of breaking up a stone, and invented an instrument for the pur-

pose, on the same principle as the one for extracting stones, and with the blades opening laterally; not finding this to possess sufficient power, he, in 1823 or 1824, constructed an instrument, clumsy and imperfect certainly, but on the same principle, and containing the rudiments of the one so efficient, simple, and, on this account, very superior to all others, which is now manufactured by him, and used by many surgeons in this country. Previous to this, Dr. Civiale had devoted his attention to the subject of destroying urinary calculus; he had contemplated the possibility of introducing some sort of pouch into the bladder, into which the stone might be received, and which would resist the action of chemical agents injected into it of sufficient strength to dissolve the foreign body.

He found by his dissections and experiments, that he could efface the curvatures of the urethra, and introduce without difficulty an instrument perfectly straight; he soon gave up the notion of using solvents, and contrived an apparatus, consisting of three branches in a canula, which when thrust out, were expanded so as to grasp the stone, and to this he adapted mechanical means for acting upon the body so seized and held. Drills of various kinds were passed through a second and internal canula, the split ends of which formed the litholabe or forceps, and these were put in motion by a drill bow, the whole apparatus being secured in a vice or mortice. In the year 1827, when lithotripsy was yet in its infancy, I witnessed the operation, through Dr. Civiale's polite attention, on some of his private patients, and having provided myself with a complete set of his instruments, on my return made the attempt to break down the stone in some cases. It was soon evident to me, that the operation thus practised was to be trusted to but in very few cases, when the stone was very small and very friable, the bladder being at the same time capacious and not irritable. My first patient, after submitting to four or five sittings, (vide case in Edinburgh Journal, vol. xxx. p. 222,) determined on having the stone cut out; this was done, as he said, with less pain than that attendant upon any one of the grinding operations, and in a twentieth part of the time; he recovered without a bad symptom.

The stone, which was hard, not very large, flat, and oval, had been well acted upon by the drill, there being several perforations and various indentations besides on the edges; but it was plain that twenty or thirty such sittings must have taken place before there could have been a possibility of entirely reducing it. The bladder was beginning to get very irritable, and every sitting would have been more and more painful and unbearable. The possibility of removing the whole of the fragments from a bladder contracted and irregular on its inner surface, would have been more than doubtful.

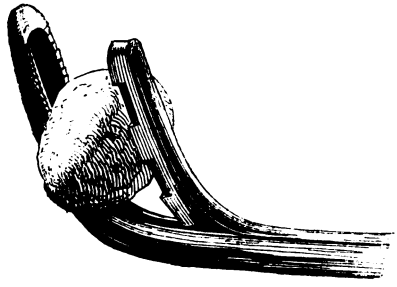
In 1828, the case related at page 394 was, however, most successfully managed by the same apparatus. Mr. Guthrie also made an attempt, in 1827, to break down a stone in a patient at the York Hospital; he used a modification of Civiale's instrument, but without success, and great difficulty was, I believe, experienced in disentangling the apparatus, and withdrawing it from the bladder. In a few cases, which appeared favourable, I still persevered in attempts to grind down the stone, and in some of them relief was afforded. In one instance, after having, as was supposed, by two operations reduced the foreign body to a small size, a good deal of detritus having been passed, the stone was seized with the urethra-forceps of Weiss; it was withdrawn without difficulty from the bladder, but slipped from the grasp of the instrument in the sinus of the urethra; it was impossible to seize it again in this situation, and besides it was too large to pass forwards; it was accordingly fixed by the finger and thumb of one hand, cut upon in the mesial line, and turned out without difficulty. The marks of the drilling are plain enough also upon this stone, somewhat larger than a haricot bean; the patient made a good recovery. But, independently of the difficulty of seizing the foreign body, the risk of entangling and injuring the coats of the bladder, and the inefficiency of the means of reducing the stone to fragments, this operation with the straight three-branch instrument was liable to objection in consequence of the injury inflicted on the neck of the viscus. It was impossible to guard against the bruising of the posterior part of the

prostate, or of the veru-montanum, in shutting the forceps by drawing them within the canula, and this not unfrequently gave rise to great irritability of the parts, to enlargements, and even abscess of the testis; the patient was thus subjected to great suffering and danger, and the progress of the cure retarded.

In 1829, a professed lithotritist arrived in this country, bringing with him Civiale's instruments somewhat modified, and rather more complicated; in the use of these he had, it appears, acquired considerable dexterity. In 1831 or 32, a second professor appeared, and for some time it was maintained that almost every case of stone could be disposed of satisfactorily, by the boring and grinding process. It was tried extensively, and after many miserable and painful failures, utterly disappointed the hopes of its advocates. When the operation was about to be abandoned, a new and favourable impulse was given to it by Baron Heurteloup; he took the idea and copied, it is said, from Weiss' second instrument, but instead of the screw employed a hammer to force together its blades upon the foreign body; a strong bed, upon which the patient was strapped and buckled down, with a vice attached, to hold the instrument during the hammering process, was found to be a necessary part of the apparatus.

All these complications have now been thrown aside, and the "Percuteur courbe a marteau," as it was called, has given place to the instrument which, by the Messrs. Weiss' perseverance and ingenuity, has been brought to the utmost state of simplicity and perfection. Whilst Mr. Weiss, jun. has been steadily proceeding in improving upon the instrument, so as to render it more safe and efficient, he has listened to such hints as have been offered: he has, at my suggestion, I believe, improved the handle, making it now of metal, and smooth, instead of being covered, as formerly, with ivory or wood, made rough. The contact with the foreign body is thus rendered much more distinct, and greater facility in seizing the stone afforded. At the suggestion of Mr. Oldham, a gentleman attached to the bank of Ireland, he has also adopted a most essential improvement, without weakening the instrument; the outer or anterior blade is

now made open, so as to receive the other. The clogging of the instrument is thus effectually prevented, the fragments being readily forced through the fenestrum. The extremity of the in-

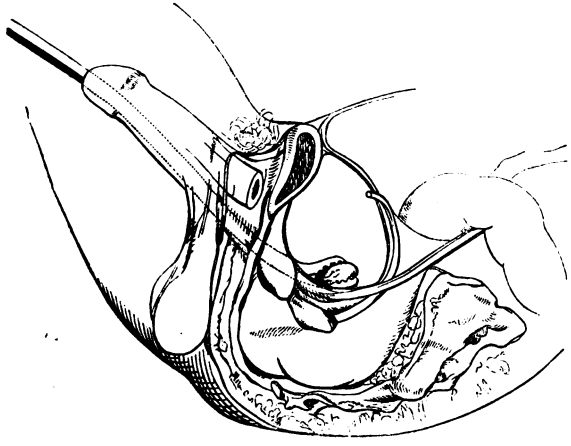


strument is here represented embracing such a stone as may safely be attached by it. In operating in the Edinburgh Infirmary very frequently with the percuteur, and afterwards with the same instrument, worked with a rack and pinion, and at a still later period with Segala's screw lithotrite, the greatest inconvenience imaginable was experienced from the impossibility of closing the blades perfectly. The beak of the instrument, in its withdrawal, was brought to the orifice of the urethra filled with detritus ; but from thence it was found an exceedingly difficult matter to disentangle it. In one or two instances it was found necessary to slit open the meatus with a bistoury, and in each instance the patient suffered as much in this part of the operation as he would in submitting to cystotomy, and the extraction of the stone. In fact, the pupils of the hospital had more than once the opportunity of making the comparison as to the apparent suffering which patients underwent—the operation of lithotomy having been repeatedly performed on the same day as lithotrity. The decision was then rather in favour of the cutting operation.

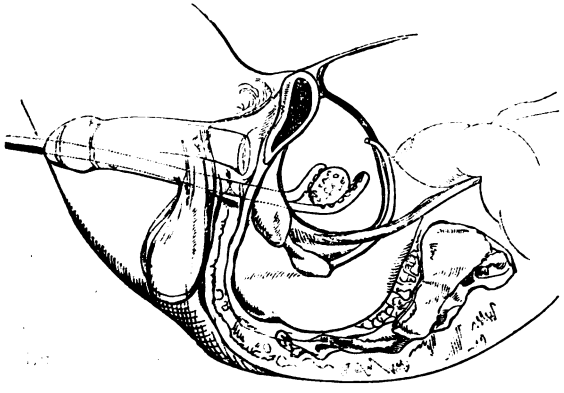
Since then, however, the operation of lithotrity is much improved and simplified in all respects; it is applicable now to a vast variety of cases, and is likely, in a few years, to supersede in a great measure the operation of cutting for stone. Patients applying to

surgeons, were until very lately, constantly recommended to submit to the knife, in order to get rid of stone in the bladder, whatever the size of the concretion, or the state of the urinary organs. On the other hand, if he fell into the hands of the grinder, no matter what the peculiarities of his case, he was as certain to be subjected to the boring or hammering processes. Now that the merits of one and the other operation are better understood and appreciated, that surgeons have thought proper to turn their attention to the matter, to study and understand lithotrity as well as lithotomy, patients have a chance of being treated judiciously and conscientiously, and to have the proceeding adapted to the circumstances of their case, resorted to. I was not slow to adopt the operation of crushing, have always had so far a favourable impression regarding it, and have throughout used the same language, though I have the credit of being an opponent of lithotrity. I have all along been, and am certainly still opposed to the indiscriminate employment of any one operation in all cases, to its abuse, and to its being practised by those alone who know no other. It can only be employed safely by those who understand well the healthy anatomy of the urethra and bladder; who are acquainted with its sympathies, vital actions, and pathological changes, who understand, and are in the constant habit of treating derangements in the functions of these parts. The operation of lithotrity is applicable in patients above the age of puberty, when the symptoms have not endured very long, when the foreign body is ascertained to be about the size of the one sketched on the last page, measuring six or seven lines, or even more perhaps, say as large as a chesnut; when the bladder and urethra are in a tolerably healthy and normal condition,—as indicated by the power to retain the urine comfortably for several hours, and to pass it in a tolerably free stream, or by the injection of the bladder and a careful exploration,—so that the stone may be seized readily, and acted upon without danger to the lining membrane. The bladder should contain at least five or six ounces of fluid. The patient is placed upon a couch, with the pelvis raised upon a firm pillow; a catheter is introduced, and a sufficient quantity of tepid water injected by means of a syringe

properly fitted to it, as recommended p. 279, in treating of sounding. The catheter is withdrawn, and the screw lithotrite introduced, the whole bent part being received within the cavity of the bladder: it is then carried to the usual situation of the stone by raising its handle. The one blade is slid back on the other, so as to expand them; they are moved slightly, and the stone seized,



as represented. The stalks which are here slightly curved should of course be quite straight. This is done with all due caution,



and it is ascertained that there is no entanglement with any

fold of the mucous membrane, by raising the point gently; the instrument is then brought towards the neck of the viscus into the position here shown, and the stone there acted upon. The pressure is applied at first gradually, the screw being alternately turned forwards and backwards. The yielding of the foreign body is felt, and even heard, and it is disintegrated and crushed, as certainly and more safely thus than by the use of the hammer; some of the instruments are made so that this method of approximating the blades may be employed in addition, but that part of the proceeding must soon fall into disuse.

Many very distressing accidents occurred in the operation with the "Percuteur a Marteau." The instruments were repeatedly broken, bent, or clogged in such a way that it was found impossible to shut and disentangle them, so that they might be withdrawn. In resorting to the hammering process some years ago, I had fully made up my mind to use very moderate force in closing the blades, but at the same time, in case an accident should occur, I had bethought me how to remedy it. Some cases had been reported in which, when the instrument could not be withdrawn, incisions were made; attempts followed, to bend back the blades, by the introduction of forceps. This appeared to me a very cruel and clumsy proceeding. I had determined, should I meet with any case of the kind, having ascertained its practicability by trials on the dead body, to pull forward the instrument as far as possible, so as to bring it into the neck of the bladder, and close to the triangular ligament, to push down the penis upon it, and protect the glans with a piece of split card or strong leather. The stalk of the instrument was then to be seized with a hand-vice, and cut through as low as possible. This can be done within two inches and a half of the commencement of the curve; there would be no difficulty then in pushing the blades containing the stone back into the bladder, and cutting them out together. An account of this proceeding is given in an abstract of a surgical lecture in the "Lancet," vol. i. 1835-36, p. 159.

The fragments may be taken up and operated upon one after

another by the same instrument; if the patient has not suffered much, the screw scoop, an instrument of the same form but without any opening in the anterior blade, may be substituted at the first sitting; with this some of the broken portions may be laid hold of, crushed and extracted. In this way, at one operation, if the stone is small, the cure may be completed with very little pain, barely more than is caused by the introduction of a bougie, and without effusion of blood. A small quantity of blood occasionally passes with the urine, and injected fluid in consequence, probably, of the posterior portion of the urethra being stretched and made straight, compressed at points owing to its curvatures being effaced. There may also be a little over-stretching of the orifice in spite of all the care in forcing the two blades in contact with the screw. The detritus which remains, does not pass readily for a few days, until the water is again evacuated in a full stream and in quantity. Diluents are given freely, opiates exhibited by the mouth or lower bowel, and general or hip baths used, if symptoms arise requiring such practice. Should any great excitement about the neck of the bladder take place, with frequency and pain in micturition, it may be necessary to abstract blood from the perineum In general the disturbance, if any, is slight; a further examination can be made in six or eight days, and such fragments and detritus as remain dealt with according to circumstances. A very few sittings will suffice to rid the patient of such a stone as it is advisable to attack in this manner. Mr. Key has lately recommended the addition to the lithotrite of two wings with a net attached, into which he proposes to receive the stone, and by that means to throw the broken portions again and again within the blades as they are opened, so that they may be at once more certainly and effectually triturated. Impressed as I am with the truth of the maxim with which this volume is commenced, I cannot approve of the proposal: a proceeding which has been gradually simplified and made of safe and easy application, would be thus again rendered complicated, precarious, and more difficult of execution.

If the stone is much larger than above indicated, and the blad-

der, as is most likely, in consequence of the endurance of the irritation, contracted, fasciculated, and irregular on the surface, presenting the rudiments of pouches, it will be absolutely impossible to make sure of removing all the detritus. Nuclei must be left, and very shortly the patient will have, instead of one stone, some five or six substituted. The suffering and danger, moreover, endured by the patient at each sitting, if these are often repeated, in an unsound bladder, for the removal of the fragments of a large concretion, are by much greater than those resulting from a well-conducted, safe, and speedy operation for its removal entire and at once. By lithotomy the excited state of the bladder is relieved by the removal of all source of irritation, by its being put at rest, its functions being suspended, and by the loss of blood from the neighbouring vessels.

In lithotrity, if the stone is large and considerable fragments left, the irritation is greatly increased. Blood is lodged in the bladder and got quit of with difficulty. The action is, perhaps, at first slow, but it becomes lighted up from the continued irritation, by the frequent contraction of the viscus and contact with the angular pieces of the concretion. Unless a very correct judgment is exercised in determining upon the practice in particular cases, and great gentleness observed in the manipulations, fatal results must very often follow. The termination, like that in the case of a woman undelivered, is very unsatisfactory. The operation of lithotomy must yet continue to be performed on children and on those of mature age, who are so ill-informed or foolish as to permit the stone to attain an inordinate bulk. The concretions in young subjects are generally composed of a very dense substance, the oxalate of lime in whole or in part, and the urethra is so narrow as to preclude the application of instruments strong enough to reduce them. The reasons for giving a preference to incision over crushing, when the stone is large, are given above.

The operation of lithotomy, if circumstances are favourable, if the patient's health is tolerably good and his kidneys sound, is very satisfactory in its results when properly performed, with

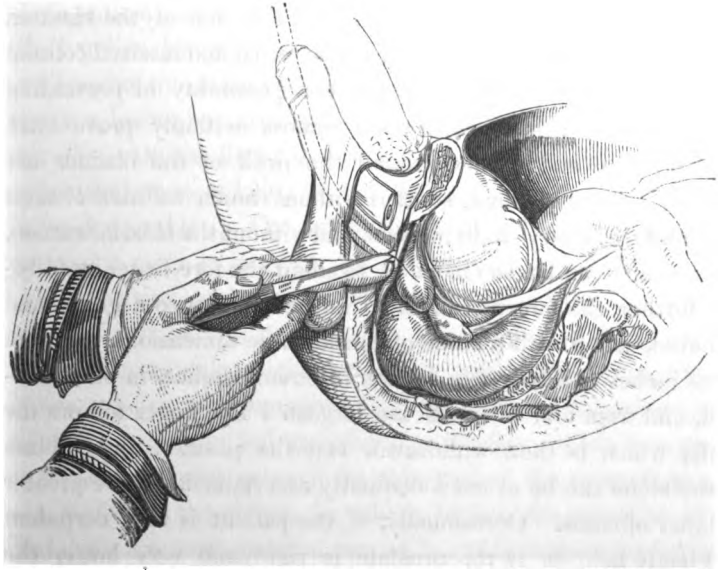
few and simple instruments and on a good plan. The incision of the perineum and of the prostate to a limited extent, is to be preferred in almost every case. The operation on the gripe and the recto-vesical method, are not now in the list of regular and established operations. The operation above the pubes, still practised occasionally, is not to be resorted to from choice. If a stone of such a size as could not pass readily through the outlet of the pelvis, perhaps contracted unnaturally, were ever met with, the high incision might be thought preferable. An opening made in this situation for the relief of retention, at some former period, has been dilated, (and may be with safety, the parts around being condensed,) for the removal of concretions. The puncture of the bladder has even been proposed by an old and very diligent pupil of mine, Mr. G. Bell, as a preliminary step to the high operation.

The cases in which the perineal incision cannot with certainty be resorted to, are rare indeed. If the patient's health is good, the only preparation for lithotomy consists in unloading the bowels, and it should be so arranged, if possible, that the action of the medicine shall have ceased some time before. The operation which I have been, and am still in the habit of performing, is conducted in the following manner. It is pretty much after the manner of Cheselden's improved operation, and that of many other good lithotomists, and has, at least, the recommendation of perfect simplicity. The position of the patient, if an adult, is properly secured so as to present a full view of the perineum, previously shaved. A boy is conveniently held on the knee of an assistant, who grasps the legs in the middle and separates the thighs. It is absolutely necessary for the patient's safety and for the success of the operation, that the limbs should be favourably placed and so retained, in order to afford every facility to the surgeon. This should be attended to with great care, the palms of the hands being applied to the soles of the feet, and so fixed by proper bands that there shall be no risk of their slipping; an additional band should be passed under the hams, over the shoulders, and secured behind. An assistant on each side separates the thighs

and keeps down the pelvis on the table, which should be firm and steady, not over high, and covered with a folded blanket. The shoulders are very slightly raised, the trunk and pelvis being as nearly as possible horizontal. Much outcry has been made against the preparations and precautions here described, and which are quite essential to the success of the operation, to its completion satisfactorily, and in a reasonable time. The professed and exclusive lithotriptists and their advocates, did not hesitate to rail against the "binding of victims," &c., at the same time that they were in the habit of fixing their patients upon their "lit rectangulaire" by straps over the pelvis and round the shoulders, and still farther by screwing an instrument with one end hooked into the bladder by a vice, to the bed. This was not all, for the unfortunate individual, thus helpless, bound, and screwed down in a most uncomfortable position, was often shaken, jumbled and turned heels over head, by suddenly knocking the feet from under this bed or operating-table. Before the patient is secured for lithotomy, it is advisable to introduce a sound, more especially in children, whose screaming is apt to interfere with the examination, in order to make certain of the presence of the foreign body; and it is proper also, that those who assist should be equally satisfied at that time as the operator. This may in the majority of cases be ascertained by the introduction of the grooved staff, which is to serve as guide for the knife in its entrance to the neck of the bladder. The staff is more readily passed before the thighs are elevated; the one which I have all along used, is of pretty large size and grooved deeply betwixt the lateral and convex aspects. This instrument is easily felt after the first incision, and the urethra opened upon it. It is hooked against the symphysis and entrusted to an assistant, with directions to maintain the position steadily from first to last, neither to turn it so as to bulge in the perineum, nor to depress the handle as the knife enters the bladder; the surgeon's left hand is thus left at liberty to guide the knife and guard important parts from danger.

The staff being passed, and arrangements made as to its being properly held, the operator should ascertain, by the introduc-

tion of the fore-finger of the left hand, that the rectum is empty. The knife, represented on the next page, is then entered pretty deeply into the perineum, about an inch, more or less, behind the scrotum, and it is made to cut downwards and outwards through the skin and superficial fascia, in a line about midway betwixt the tuberosity of the ischium and the anus, and, beyond that orifice, towards the sacro-ischiatic ligament. The fore-finger of the left hand is then placed in the bottom of the wound, about its middle, and directed upwards; any fibres of the transverse muscle, or of the levator of the anus, that offer resistance, are divided by the knife, its edge turned downwards; the finger passes readily through the loose cellular tissue, but is resisted by the deep fascia, immediately anterior to which the groove of the staff can be felt not thickly covered. The point of the instrument is slipped along the nail of the finger, and, guided by it, is entered, the back still directed upwards, into the groove at this point. The finger all along is so placed, as to depress and protect so far the coats of the rectum, and the same knife, pushed forwards, is made to divide the deep fascia, the muscular fibres within its layers, a



very small portion—not more than two lines—of the urethra, anterior to the apex of the prostate, together with the prostatic, a portion of the canal and the gland, to a very limited extent. The commencement of this second incision, the position of the hands and knife, are here shown in a very correct sketch of the viscera of the pelvis, with their relative size and position. The drawing of the anatomy of this sketch was made, with the utmost degree of care, by Mr. Bagg, jun., from nature and from dissections made by my excellent friend Mr. Wilson, of Sydenham College School of Medicine. The external incision cannot be too free, within certain bounds. No purpose can be served by dividing the scrotum, or the integument of the hip, nor is greater space gained by cutting any muscular fibres in addition to those of the transverse and levator ani and those surrounding the membranous portion. But the internal incision must be very limited indeed; it should certainly not extend beyond seven lines from the urethra outwards and downwards, as marked on the sketch; the less that is cut the greater will be the patient's safety. The object in following that method is, not to interfere with the reflexion of the ileo-vesical or pelvic fascia from the sides of that cavity over the base of the gland and side of the bladder. If this natural boundary betwixt the external and internal cellular tissue is broken up, there is scarcely a possibility of preventing infiltration of urine, which must almost certainly prove fatal. The prostate and tissues around the neck of the bladder are very elastic and yielding, so that without much solution of their continuity, by a very slight incision, and without the least laceration, the opening can be so dilated as to admit the fore-finger readily; still further, the forceps can be introduced upon it as a guide, and removed, along with a stone of considerable dimensions, say from three inches to nearly five inches in circumference, in one direction, and from four to six in the largest. The finger follows the knife, which is then withdrawn, and the position and volume of the stone can be at once distinctly ascertained, in the greater number of cases. Occasionally, if the patient is very corpulent and badly held, or if the prostate is rigid and very large, the

bladder being thus removed from the surface of the perineum, it may be difficult to make the internal opening fully and with precision. In such cases, it may be prudent, after dividing the membranous and prostatic portions of the urethra, to lay aside the knife, and to introduce gently a gorget with a bluntish edge, such as was used by the late Mr. Martineau, of Norwich, and still employed very satisfactorily and successfully by his successor, Mr. Dalrymple. The opening in the bladder will thus be enlarged smoothly and to a sufficient extent. I have never, as yet, used a gorget, but, in such a case as the one described, and which is sometimes presented, I might now be induced to make trial of it. By the careful use of the finger, I have always attained my object, without much delay or difficulty. If possible, and it almost uniformly is so, the stone should be felt with the finger before any instrument is introduced or attempt made to seize it. The position of the foreign body can be changed before all the urine escapes, and the certainty of seizing it at the first attempt is much increased. The forceps, suited to the shape of the stone, thus also ascertained, are guided by the finger; they are brought into contact with it shut, one blade is then slid underneath, as it lies in the posterior fundus, the handles being so far elevated. The instrument is closed gently, and the point raised and brought towards the external incision, before any attempt at extraction is made. Careful examination with the finger is now proper, as regards the position in which the stone is held; if necessary, that is changed to one more favourable. The handles are now depressed, and the extraction made in the axis of the pelvis.

The seizing and extraction of the stone is without doubt the most difficult part of the process. The facility of doing so will, in a great measure, depend upon the preliminary steps, the position and size of the opening; but even although these have been tolerably well attended to, difficulty will often be felt by a young and inexperienced surgeon in this part of the proceeding,—in accomplishing the object, for which, in fact, the operation is undertaken, the most material part of it, and that upon the satisfac-

tory attainment of which the future comfort of the patient, and the reputation of the surgeon must inevitably rest. Much delay has arisen in this part of the business, and not a few complete failures have occurred: this should not be, and it is equally the duty of the pupil to practise the seizing and extraction of the stone, as it is for him to study the relative anatomy, so that he may be enabled to cut into the bladder with precision and safety. It may have been pretty well made out by the surgeon on sounding, that the stone he has to encounter is of large size, and his suspicions may be fully confirmed by examination with the finger through the incision. If above a certain size, it is impossible to bring the foreign body through an opening on one side of the prostate such as described, without bruising and laceration; it will then be proper to provide more room for its exit, and this is gained by making a similar incision in the opposite side of the neck of the bladder. This is done by passing a narrow-bladed and blunt-pointed bistoury along the finger, and directing its edge towards the right tuberosity of the ischium. There is no occasion, if the external incision has been well planned, properly made, of sufficient extent, and low in the perineum, for any further division of the skin and superficial parts. No complicated machine is required to make this bilateral division, and it is quite time enough when the necessity is fully ascertained to exist, to have recourse to it. The single lateral incision affords sufficient room to admit of the removal of the stone in nineteen cases out of twenty, and there can be no purpose served therefore in always making a cut in both sides of the gland, and thus endangering the emasculation of the individual. In removing large stones, sufficiently long forceps must be used. The extraction, after the stone is satisfactorily grasped, must be made in the right direction, slowly and deliberately; the instrument is moved forwards and backwards gently, so as to dilate the parts, and these are pushed back as it were upon the stone by the fingers of the left hand, whilst the extracting force is kept up. Forceps without teeth, but lined with coarse linen on the inner surface of the blades, will be found more serviceable than those in common use. The stone can scarcely

be slipped, and there is less risk of chipping it. Some stones are so exceedingly brittle, that with the utmost care their giving way and crumbling down cannot by any possibility be prevented. Again, some smaller stones may be present along with the principal one, the size of which has led to the necessity of resorting to the cutting operation. In such cases, the scoop will be found a most useful adjunct to the apparatus. With that instrument, and the finger, fragments, or small concretions, can be secured, and brought out quickly; there is seldom any necessity for washing out the bladder. The cavity is cleared with great care, and if the fragments into which a stone has broken are large, they can be put together so as to make sure that they are all extracted. The cavity must be explored with the scoop or searcher, (a sound with a bulbous extremity,) passed by the wound, and the flow of urine encouraged by diluents. It will, always be prudent in such cases to make a second examination through the wound before it has contracted much, whilst yet the urine passes off freely in that way, when the parts are relaxed and their sensibility somewhat abated.

If the incisions are placed low, as recommended, and the knife used cautiously in the deep incisions, there will be no trouble from bleeding. The artery of the bulb, which is often cut through want of care, and furnishes blood very freely, will, I believe, be quite safe in this mode of proceeding, whether it follows the usual course or not; as will the pudic itself, whether it lies protected by the ramus of the ischium, or comes from the internal iliac direct, and without passing behind the lesser sacro-ischiatic ligament. In making the incisions on a straight staff it is admitted by the advocates for the practice that it is a very difficult matter to avoid wounding the artery of the bulb. The smaller vessels, the transverse artery of the perineum, and branches of the hæmorrhoidals, soon cease to bleed. Out of about a hundred patients, on whom I have performed the lateral operation of lithotomy, only one, an aged man, suffered in consequence of hæmorrhage, and in him the artery of the bulb was untouched, but the branches of the hæmorrhoidals were loaded with earthy matter, and incapable of contracting or retracting. After the

bladder is cleared of the foreign matter, and with the view of favouring the flow of urine, preventing its infiltration, and thus ensuring, as far as possible, the patient's safety, it is advisable, in my opinion, to introduce a gum-elastic tube, and secure it by tapes to a band round the waist; the tube varies in length, according to the age of the patient and depth of the perineum, from three to six inches, and in size also. It is kept clear of coagula for a few hours; its presence occasions no inconvenience, and when the urine comes away plentifully and clear, as it generally does in a few hours, through the canula, and by its side, all danger is nearly passed. The presence of this canulain the whole track of the incision affords great facility for arresting any oozing that may arise from vessels, either arterial or venous; the latter, about the neck of thebladder in old people, are often much enlarged, forming a plexus. They should properly not be interfered with; they furnish, if wounded, a good deal of blood, and if the parts about the neck of the bladder are disturbed and lacerated, or bruised by the rude and forcible use of forceps, or if urine is admitted to these open vessels, its escape not being encouraged, as advised, inflammation of their coats, attended with very serious danger, is apt to ensue. The oozing from small vessels, if it persists, can readily be arrested by pushing some pieces of lint with a strong probe along the tube, which of course is then carefully kept pervious. The successful result of many cases in which I have been concerned, I am much inclined to attribute to the employment of the tube; much anxiety and risk is done away with, and its presence never can do harm.

My old friend, Mr. Chrichton, of Dundee, who has had a good field for experience in these diseases, and who has performed the operation of lithotomy about as often as any person now alive in these islands, seems inclined to recommend the immediate closure of the incisions. One or two young patients have, in his hands, made very rapid recoveries, and, by chance, little or no urine has passed by the wound. This he calls a cure by the first intention, and his desire is to promote it in the majority of instances, if not in all. He does not say how the object is to be attained,

nor has he brought any proofs of the superior safety of his method, even admitting that it is practicable. The cessation of the flow of urine by the wound is always an alarming circumstance, one leading to suspicion and apprehension of mischief. The stoppage of the secretion, or the escape of it into the deep cellular tissue, are almost equally fatal. Mr. C., in his last paper on the subject, is inclined to be very severe on those who have tried to do away, as much as possible, with his favourite operation of cutting for stone, by adopting lithotrity in favourable cases. He condemns a practice of which he has had no experience, and relates a case, in confirmation of his opinion, in which the stone had been broken and removed; the patient was in bad health, and emaciated. He sounded him repeatedly, but could detect no stone. I believe, though it is not stated in the communication in question, that I was the operator to whom he is disposed to attribute blame. The case speaks well for lithotrity. The patient was not in good health when he was admitted into the Edinburgh Hospital. There was reason to suppose that his kidneys were not sound. He was not in a favourable state for any operation, certainly not for lithotomy, and to this he had a decided objection. He had indeed fully made up his mind not to submit to be cut, had it been proposed to him. The stone, of considerable size, from eight to ten lines in diameter, was broken down by the "percuteur à marteau" at repeated sittings. The patient was relieved, and, as it appears by Mr. Chrichton's own showing, was cured of stone in the bladder. It is questionable, if Mr. C. had been applied to, and more especially if he had tried and succeeded so far in his first-intention plan, if any opportunity of sounding repeatedly would have been afforded many months after.

The tube is removed so soon as it is reasonable to suppose that the cellular tissue is closed by plastic effusion. In children it need not remain above twenty hours; in patients advanced in life, and of lax fibre, it had better be retained for forty or fifty hours, at least. Immediately on lodging the tube in the bladder, the finger is passed into the bowel to ascertain that all is safe in

that quarter. The rectum has been wounded, though perhaps slightly, even by the best operators, and the struggling of the patient is made sometimes to account for the accident; it should not happen if the surgeon is well assisted, but if it does, some remedy must be adopted. The urine will continue to flow perhaps in part by the rectum, and a natural cure cannot readily take place. The earlier the sphincter of the anus is divided, as in the complete fistula in ano, the better will be the patient's chance of being freed from the annoyance.

Cases are occasionally presented in which a previous operation has been performed. The former wound may not have closed entirely, the parts are condensed and rigid. The surgeon must be guided by the circumstances in deciding upon his line of proceeding. He may dilate the original opening, cutting on the finger, among the altered structures, and guided, of course, by a staff in the urethra; or he may make fresh incisions on the right side of the perineum; this he will do if the others are perfectly closed. The staff must be grooved on the opposite side, so as to point to the tuberosity of the right ischium. The incisions are made in the same way deliberately, under the same guidance, and to the same extent, as described, both in the superficial and deep parts. I have had occasion to perform this operation in three or four instances, and have found no difficulty in reaching the bladder, or accomplishing the removal of the stone; all these cases turned out favourably.

The operation of lithotomy, about which so much dread has lately been excited and fomented by interested persons, and which certainly, according to the complicated methods, was formidable and not over-successful, if performed in the very simple and easy method recommended, is effected with much less pain than is supposed; it is completed with perfect safety in a short space of time, and offers very favourable results. It is, however, an operation that never ought to be undertaken without due consideration of all the circumstances that may arise; and the surgeon who does undertake it must have resources within himself to meet with and overcome difficulties in all the various

stages of the proceeding. Were the circumstances of all cases precisely similar as regards the depth and resistance of the parts, the size and consistence of the prostate, and of the foreign body, the capacity of the bladder, the width of the outlet of the pelvis, then the operation might, always with certainty, and in the same manner, be completed in a given time. But it is not so; unforeseen obstacles occur, from first to last, and the operator must make up his mind to proceed in all cases with the greatest caution and deliberation; he must set about it with a determination to finish his task safely and well, at the same time quickly, if the state of parts is favourable and nothing unusual intervenes.

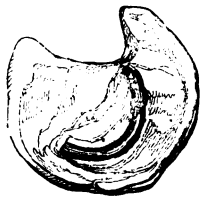
A case occurred to me, very lately, in which difficulties that could not have been expected, were encountered. A boy of about six years was brought to me by Mr. Wadsworth, Broad Street, Golden Square. He had only just arrived from a distance in the country. A sound was introduced without difficulty, and a stone discovered. His health was stated to be good, and his bowels in proper order. He had some medicine given him, and, a few mornings after, on proceeding with Mr. W. and his partner, Mr. Russel, to cut him, and on turning up his perineum, a plaster was found applied to it. There was great induration of all the parts around a large perineal abscess, which had opened imperfectly. A free incision was made through it, and towards the neck of the bladder; this was reached with some difficulty, in consequence of the rigidity of the tissues. It was opened, and a stone of considerable size grasped. It was friable, and although, in the natural state of parts and with some delicacy and care in manipulation, it might, perhaps, have been brought out entire, this could not be effected in their altered and abnormal condition. It had, accordingly, to be removed piecemeal by the use of the scoop. The proceeding, which would, in ordinary circumstances, have occupied less than a minute, was thus necessarily protracted to six or eight.

Calculi are sometimes lodged in different parts of the urethra. They may be so situated behind a contraction in the posterior part of the canal, or within the meatus, as to obstruct the flow of urine. If not large, and its escape from the bladder very recent, it may be possible to bring the foreign body forwards by pressure with the fingers on the perineum, assisted by the straining efforts of the patient. It may be extracted from the orifice, perhaps, after a slight division, by means of a small scoop. But stones of a larger size are often lodged and so impacted in the passage, that there is no possibility of moving them; they may have remained in the same position, acquiring additional bulk, for a number of years.

Four or five years ago, in the Edinburgh Hospital, I cut out from the sinus of the urethra of an old man, from whose bladder I had extracted a large calculus at least ten years previously, five or six stones formed on pieces of straw. He laboured under stricture, when first under my care; this was relieved at the time he had lithotomy performed, but it appeared that, subsequently, difficulty in micturition arose. It is probable that in the dilated part behind the stricture a small concretion had been detained or formed; to displace this, and procure more free evacuation, he had recourse to the introduction of straws into the passage, and, in fact, I discovered him, in the midst of one of his operations with this primitive sort of bougie, at the gate of the hospital, as he came to be admitted.

A very extraordinary case is detailed in the "Edinburgh Medical and Surgical Journal," No. 74, p. 57, in which I extracted a concretion rather large for the situation it occupied in the urethra. The patient, then approaching the age of fifty, had, as he stated, when a boy, pushed a smal lbrass curtain ring over the penis till stopped by the scrotum, in order to prevent the urine passing off during the night. The swelling that ensued prevented its removal; he kept the occurrence secret; the tumefaction gradually abated and the ring disappeared. The hardened mass increased in size, and, latterly, the functions of the parts, which had been

pretty perfectly performed, began to be disturbed. The foreign body was cut upon and removed. On making a section of it, the



greater part of the ring was found, as here seen, still to exist, as the nucleus. The continuity of the erectile tissue, which had thus been cut through gradually, was again perfectly established. It is always advisable, when possible, to bring calculi forwards to the orifice and remove them thence by dilatation, if not, to push them back, and, at the same time, pull the scrotum forwards, so as to extract them by a free incision in the perineum. It will be found a most difficult matter to close entirely, any opening anterior to the scrotum, owing to the thinness of the coverings.

CHAPTER XIII.

INJURIES AND DISEASES OF SEROUS CAVITIES.

The injuries of shut sacs must necessarily be accompanied in many instances by corresponding lesion of the parietes and of the contained organs. Fracture of the ribs, with wound of the layers of the pleuræ, of the lung, and consequent emphysema, has been considered in Chapter III. The wound of the pleura is necessarily accompanied by effusion of more or less blood and serum into the cavity. This is, in the majority of cases, absorbed; but, occasionally, as a consequence of the putrefaction of the effused fluid, from the admission of air, or of inflammatory action, secretion of purulent matter takes place. Emphysema, occasionally, also, is the result of idiopathic pleuritis, or of disease commencing in the bronchial tubes, or substance of the lung. The symptoms are generally of an acute nature, the high fever, difficult breathing, and violent pain, in part abate on the accession of suppuration, but the patient is ill at ease; he is flushed at times, his frame is undermined and shaken by violent rigors, his circulation is hurried and his breathing embarrassed. The enlargement of the side of the chest, the œdematous condition of its coverings, the separation of the ribs, the dulness on percussion, the want of respiratory murmur, the œgophony, when the cavity is not full, and some air is still received by the lung, the succussion felt by the patient, and even discoverable to the surgeon on placing his hand or ear to the chest when any

sudden motion is made, will confirm the diagnosis. The contents are often partly serous, and partly purulent; the serosity, when the patient is still, occupying the upper part of the cavity. The abscess may, however, be of a chronic kind, of many months' duration; sometimes it has, it would appear, existed for a year or two, with immense expansion of the chest, and complete collapse and condensation of the lung. When the collection is large, the heart is displaced and thrust against the ribs of the opposite side; the unaffected cavity of the pleura and lung are also thus encroached upon, and their functions interfered with. The evacuation of purulent fluid from the cavity of the pleura must be had recourse to, so soon as its existence is ascertained. The physician will be much to blame if he neglects to call in the aid of the surgeon, as I have known to be the case even in the clinical wards of a public hospital, until the matter is about to make its way to the surface, by the absorption of the intercostal muscles, when the skin has actually become discoloured, and is beginning to be thinned. Pointing and fluctuation must not be waited for here as in many other situations; the symptoms and signs above detailed will warrant an opening being made without recourse to exploratory puncture. In such a case, however, as empyema, no harm can arise from making a minute perforation with a grooved needle previously to dividing the parietes of the cavity more extensively, for the evacuation of its contents; this exploratory proceeding is by no means so new as is supposed, nor is any modern practitioner entitled to the credit of the invention. Many surgeons long ago were in the habit of introducing one of the old-fashioned and coarse cataract needles into swellings of a doubtful nature; it is a practice which, in my opinion, is now resorted to very unnecessarily in a vast number of cases, and is sometimes productive, as formerly remarked, of much harm, when applied to solid growths. The operation of paracentesis thoracis being determined upon, the patient should be placed so that he can be turned on his face readily, should any embarrassment in breathing occur; an incision of about an inch and a-half long is made over the space betwixt the fifth and sixth rib, midway betwixt their sternal and

spinal attachments; the upper edge of the sixth rib is felt for, and the point of the bistoury cautiously entered through the intercostal muscles and pleura; the point of the instrument will then be felt to move freely and without resistance, and may be withdrawn a very little, when matter will appear. The nature of the accumulation being clearly made out, and the diagnosis confirmed, the incision may be enlarged to a slight extent so as to permit the free escape of the fluid; this takes place in jets during expiration, whilst air enters when the chest is expanded. It is no bad plan to place in the wound, a short silver or pewter canula fitted with a plug, which shall fill up and close it completely after the escape of a certain quantity of matter, not so much however as to cause a vacuum: the plug should be placed in the tube after an expiration; the matter is allowed to escape from day to day, so as to favour the expansion of the lung, and the contraction of the cavity of the chest; in some cases this takes place to considerable extent, the lung being in whole or part obliterated and hepatized. Many patients suffer from irritative fever, and this is to be provided against by every possible means, by free evacuation of the contents of the cyst, at the same time that the accumulation of air and the putrefactive process are by every possible means prevented. The operative procedure is not attended with risk, but even though the cavity is greatly expanded and the diaphragm depressed, the perforation must not be made by the random thrust of a bistoury or trochar.

Injuries to the abdominal parietes of the serous envelope and contents take place from direct violence, or from concussion and general bruise; the muscular or tendinous fibres are thus torn or separated, the solid or hollow viscera are displaced or lacerated, and blood or their contents effused into the peritoneal sac; this is attended with collapse, which is often not recovered from, or it is followed after a time by inflammatory symptoms, with remarkable depression of the vital powers; a fatal termination very often supervenes, and at no distant period from the infliction of the injury. The cavity is opened by sharp weapons, the contents may escape injury, but they may become displaced and compressed,

so that their functions are interrupted. The wound may be small and the entanglement of a portion of the floating viscera may be suspected from the symptoms, the inverted peristaltic motion, the pain and obstruction of the bowels. A boy was stabbed in the abdominal parietes, near the umbilicus, with a knife, the point of which had not passed beyond the muscular walls; symptoms of strangulation and death ensued; a very small knuckle of intestine was found entangled in a transverse opening of the internal oblique, close to the linea semilunaris. In such a case the rule should be to cut down upon the wounded part, and reduce the protrusion by enlarging the internal opening if necessary. Some part of the intestine or of the solid viscera may be involved, and if so, general means only can be employed, in order to arrest inflammatory action, to put the parts to rest as much as possible, and allay irritability by opiates and other such medicines. Any active interference of art, as by enlarging the wound and pulling out or stitching the bowels if the division is extensive, is calculated to increase the danger, already sufficiently great, in these cases; trust must be put in the efforts of nature.

Accumulations of serum take place in the peritoneal sac from disordered circulation, from disease of the solid viscera, or from a cachectic state of the system, brought on by a variety of causes, as profuse discharges, abuse of mercury, or of blood-letting. Encysted collections generally connected with disease of the appendages of the uterus are also met with; these slowly attain an inconvenient size. Ascites, the collection in the general peritoneal cavity, is also a gradual process; the tumour is firm and equal on the surface, smooth and shining from the stretching of the integuments. Distinct fluctuation can be perceived on striking gently with the points of the fingers on different and opposite parts of the swelling. No sound is emitted, and there is not the same elastic feeling, as that communicated by tapping gently on a tumour caused by the accumulation of air (tympanitis) in the bowels, or in the serous cyst, if that is ever the case in the living body. The encysted dropsy is at first generally confined to the hypogastric and iliac regions of one side. It rises into the ab-

domen, and sometimes attains a most enormous size, perhaps after many years. I have met with cases in which the disease had been in progress nearly twenty years. The tumours were formed of various cysts, and had at last totally incapacitated the patients for the least exertion. It becomes necessary when medicines which promote the secretion, more especially from the kidneys, have failed to give relief, and when the distension is very great, causing interruption to the functions of the viscera, particularly of the chest, and to great anasarcous swelling of the lower extremities, to draw off the fluid by surgical operation. This is to be avoided as long as possible, more especially in the ovarian dropsies, for the operation is only palliative; the secretion always goes on afterwards much more rapidly than before, and the necessity for repeating it becomes more and more frequent and urgent. Many patients go on for years, having temporary relief thus afforded from time to time, the periods betwixt the tappings becoming shorter and shorter. The aperture in ascites is generally best made below the umbilicus in the linea alba. The bladder is emptied, though this is of no great moment, seeing that there is no likelihood in such a case of its rising near to the place of incision. The abdomen is previously surrounded by a broad band of flannel with the ends split; the middle portion of the bandage, made to fit better to the convexity above and below, by triangular pieces being cut out and the edges joined, is placed over the fore part of the abdomen, and the ends are crossed behind and entrusted to assistants. This is done to give uniform support during the evacuation of the fluid, to prevent faintness from the accumulation which would otherwise take place in the branches of the portal veins, and to prevent, also, the giving way of any vessels, and the effusion of their contents into the peritoneal cavity. The umbilicus is felt for, and an opening cut in the bandage a little below it. A small incision is made through the integument with the point of a bistoury. This should be made to penetrate the serous membrane. A minute stream of fluid follows, and the trocar is then introduced. I have lately used a trocar with the edges and point rounded off; and in

making the perforation in doubtful cases of encysted dropsy, this cautious mode of proceeding is always the most advisable. In ovarian tumour, the cyst is often condensed, the fluid is thick, glairy, and albuminous, and the fluctuation not very distinct. The incision should be made on the most prominent part where there is a chance of adhesion existing betwixt the serous surfaces, and less risk of the interposition of any important parts. The position of the vessels must be avoided, but it must be recollected, that the abdominal parietes yield very unequally; and though it is sometimes desirable, even in the common dropsy of the belly, to tap in the linea semi-lunaris, it is no easy matter to find it. The course of the epigastric is known and can be avoided, the branches of the circumflexa ilei, which ramify on the lateral parts, will not prove troublesome. In fact, bleeding, when it does take place, is into the cavity, from venous branches deprived of their accustomed support. Surely, no practitioner at the present day would, upon the chance of finding a tumour of the solid or fluid kind, attached by a pedicle, think of making an extensive incision with the view of its extirpation; such things have been done, but with very deplorable results. Correct diagnosis in abdominal swellings is not always very simple or easily attainable. Tumours have been supposed to exist when they did not; and as to their nature and attachments, there are no means afforded of predicating with certainty. All this and much more, the various attempts have shown but too satisfactorily. After tapping, the abdomen is to be supported at first by the band, but after a short time, in addition to this, or, instead of it, is to be employed a broad roller, which must be applied smoothly and with a moderate degree of pressure.

A consequence of contusion or compression of the scrotum and its contents, the glands and their serous envelopes, effusion of blood occasionally occurs to a considerable extent. The extravasated fluid generally occupies the cellular tissue and interspace of the different layers covering the tunica vaginalis. The tissue is filled, and not unfrequently it is broken down, and large masses of coagulum are accumulated. This is attended by

great swelling, pain, and discoloration, which are very alarming to the inexperienced. If the patient is made to observe the recumbent position, the tumour being, moreover, properly supported by a small pillow, and at the same time proper antiphlogistic treatment pursued, all general or local stimulation being avoided, and active treatment, if need be, superadded—such as general bleeding, (not local certainly,) purgatives, antimonials, and fomentations,—the swelling will gradually become less tense and disappear. This is the most common form of hæmatocele, but cases occur, though rarely, in which the cavity of the tunica vaginalis is the seat of the bloody collection. This may take place, the parts being previously in a sound state, but the distension is attended with great suffering; generally it supervenes upon a serous accumulation, as a consequence of injury, and it may be combined with extravasation into the cellular tissue. The same treatment is applicable in the first instance; at an after period evacuation by puncture may be resorted to.

Hydrocele or accumulation of serosity in the tunica vaginalis testis, is a very common disease, and is often not traceable to any exciting or remote cause. It is attributed sometimes by the patient to powerful exertion of the abdominal muscles, or to external injury; more frequently it depends on thickening of the coats of the testis and about the epidydimis, the result of acute or chronic disease; not unfrequently it is connected with some affection of the urethra. Effusion into the serous envelope of the testis makes up part of the swelling in the greater number of acute inflammatory attacks of the part; this is absorbed as the action abates, but frequently part of the fluid is left, and the balance betwixt the absorbents and exhalents being somewhat destroyed, greater accumulation takes place; or this often occurs without previous pain or tenderness, and the patient's attention is first attracted by some degree of weight and enlargement of the part. The increase is generally very gradual; after a time it may attain a very great bulk, and contain even many pints of fluid. The different layers covering the tunica vaginalis, are then thickened as in large hernia, and the fluid is of various consistence and

colour. It is generally straw-coloured and contains albumen; sometimes it is dark, thick, and glairy. I have occasionally seen it coagulate on cooling, and it sometimes also contains shining flakes of cholestrine. Collections of serum take place in cysts along the cord, unobliterated parts of the neck of the peritoneal protrusion. These exist alone or accompany the collection in the vaginal coat of the testis. The hydrocele of the cord often attains a large size and descends into the scrotum. The testicle in such cases is frequently distinguishable at the lower part of the tumour. In the hydrocele of the tunica vaginalis testis, the gland cannot be detected or its condition ascertained, until the fluid is evacuated.

Watery swellings of the scrotum are also met with, a result of injury or of some disease in the neighbourhood. In inflammatory œdema of the part, the serosity occupies the cellular tissue. I have seen a number of these cases following sores of the prepuce or glands, sores or fistulæ about the anus; occasionally, also, this swelling, with erythema of the scrotum, arises without any local cause that can be discovered; sometimes it has been attributed to slight injury. In hospital practice several cases of the kind have now and then presented about the same period. The distension of the scrotum is sudden and considerable; the tumour is slightly red and shining, and very soon a dark or greyish patch is perceptible at the lower part. Unless free incisions are resorted to, the part suspended, and active general and local means employed, the cellular tissue, the skin, and the coverings of the testis, will be lost as effectually as if urine had been extravasated. I had no less than six such cases in the Edinburgh Hospital at one time, in an unhealthy season, and in different stages of their progress. The loss of cellular tissue will depend upon the period at which the case is presented, and the activity and judgment with which the treatment is conducted. Anasarcous hydrocele is also met with as an accompaniment of general dropsy.

Tumours of the scrotum, caused by collection of serous fluid in the tunica vaginalis testis, of moderate size, can readily be distinguished from all other swellings of the part, and these are

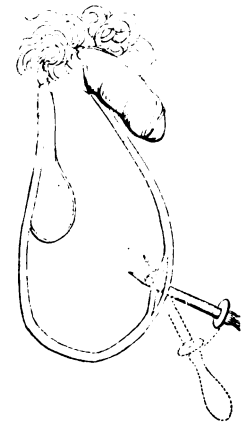
numerous and of various consistence and composition. Hydrocele is generally smooth and uniform on the surface, and of a pyriform shape, the skin is tense and shining; the tumour is often translucent, fluctuation can be readily detected, and the cord felt loose and unencumbered when the neck of the swelling is grasped and pulled down. The enlargement will be described as having commenced at the lower part and gradually ascended towards the ring. The general character of hydrocele is pretty distinct and cannot be mistaken; many of the signs, however, may be wanting. The translucency of the tumour may be obscured by the thickness of the tunics, or by the discoloration and alteration of the contents. The feeling of fluctuation may be destroyed in some measure from the same causes. The freedom of the cord may be lost in consequence of the extension of the swelling upwards, or by the formation of another collection in its course, or by descent along it; for hydrocele of the cord and tunica vaginalis testis, hydrocele of either, and hernia, often co-exist. The swellings caused by fluid collections on the cord can be distinguised by fluctuation, which may be communicated or not to the scrotal tumour. In the majority of cases the exact state of matters may be cleared up by desiring the patient to exert his abdominal muscles, as in coughing, and by ascertaining the extent of the impulse; when the patient is placed in the recumbent position, and pressure made upon the part, if there is a descent from the abdominal cavity, reduction will generally be effected: this cannot possibly occur if the tumour is encysted. No one sign is to be depended upon in forming a diagnosis; it is only by a review of all the circumstances, and an inquiry into the history, that mistakes can be effectually guarded against.

The fluid may be drawn off from the tunica vaginalis by means of a trocar and canula, so as to remove the swelling entirely, in case of pure hydrocele. Very frequently thickening and enlargement of the testis and its tunics make up part of the tumour; this is often ascertained beforehand by the feeling of hardness at the posterior part. The fluid may he removed, but if the tumour is not large and very tense, little advantage is gained by any such operation. If the enlargement is of a simple

nature, suspension of the part or recumbent position, for a time, may be advisable. The abstraction of blood locally, the application of some discutient plaster, as that of ammoniacum, with or without the addition of mercury or iodine, the repeated blistering of the part, the exhibition of deobstruents internally, will be had recourse to according to circumstances, as the size, hardness, duration, or obstinacy of the disease. In very many cases, attention to the state of the urethra will be found useful, and, in fact, indispensable to the cure. In cases where the testicle is unaltered, or but slightly, it is impossible to feel it, or to ascertain, with any certainty, as already remarked, its real condition, until the tunica vaginalis is emptied. The gland occupies the posterior and inferior part; it is situated lower, and does not project quite so much in general as might be supposed from an inspection of the plan introduced at p. 433, where the testicle and cord are made to appear very prominent, in order that the risk which attends incautious tapping might be better shown. The existence of fluid in considerable quantity, and the propriety of its evacuation being very apparent, the palliative mode, by puncture with a small trocar and canula, may be adopted. The coverings are put upon the stretch by grasping the swelling behind with the left hand expanded, whilst the trocar, held in the right, is introduced, perpendicularly to the surface, at the most prominent part, and about midway betwixt the neck and lower part of the tumour; this is to be done quickly, but steadily, and it is slid, not plunged, into the swelling. After the point of the instrument has penetrated so far as to carry the end of the canula fairly within the tunica vaginalis—and this is at once known by the freedom with which it moves, and by the want of resistance—its direction is changed, in some measure. At the same time that the instrument is directed upwards, the tube is pushed forwards by the thumb into the cavity over the stilet, which is withdrawn within it, as shown on the next page. A lancet-pointed trocar, with a spring canula—Andre's may be used for the tapping only; but the common round one answers the purpose very well, if in good order and not over

large. The canula is withdrawn so soon as the cavity is emptied, the opening is slightly squeezed together, and the part supported by a bag-truss for a short time. Sometimes the fluid is not reproduced, and the patient, by this simple and very slightly painful proceeding, obtains a radical cure. It so happens, occasionally, that the whole of the fluid cannot escape from one opening; there are partitions in the cavity, and this may have been the case from the first, or, as a consequence of inflammation in any way excited, the cyst may have become multilocular. Instead of drawing off the fluid thus, and permitting the sac at once to collapse, a different mode of procedure has lately been practised. It consists in making one or more punctures with a largish needle through the coverings into the vaginal coat, so as to permit merely a drop or two of the serosity to ooze out externally. The internal opening, however, remains pervious for a time, and the contents are admitted into and diffused freely in the cellular tissue, betwixt the layers; an anasarcous hydrocele is thus substituted for an encysted one, and the fluid that has escaped is removed by absorption. This little operation may be repeated

again and again, of course with due caution, when the contents of the tunica vaginalis are diminished, and the surfaces come nearly in contact. These methods, however, cannot be depended upon for a permanent cure, the secretion in general re-accumulates, and after a time, the tumour again proves annoying from its bulk.



The patient may be satisfied to have the tapping or puncture repeated from time to time, but generally a radical cure is desired. Some very severe and very hazardous operations have been resorted to for this purpose, which the absence of pain and danger from the disease render unjustifiable. It used to be the practice to lay open the tunica vaginalis, with its superimposed tissues, by an incision from one end of the tumour to the other; to fill the cavity with charpie, which was retained for eight or ten days, until suppuration was fairly established, and then to dress the two surfaces of the serous membrane separately. The cavity was sometimes laid open by caustic potass, and again inflammation and discharge were excited in it by the introduction of a seton, the size of which was gradually diminished. Any one of these proceedings was attended with great suffering, and a tedious confinement; after all, they were not more effectual than the simple method, by injection, now generally practised. The serum is evacuated, as above shown, and especial care must be taken, when injection is contemplated, that not only the point of the canula be perfectly introduced into the cavity, but that the opening near its extremity, which is necessary for its fitting accurately to the stilet, should also be deeply lodged. If this is not attended to, or if through carelessness, the tube is withdrawn before or during its progress, the tunica vaginalis may be separated from the investing layers of the fascia, and the cellular tissue become partly filled with

irritating fluid instead of the serous cyst. It is a mistake of a very dangerous nature, and one which has sometimes been followed by extensive suppuration and sloughing. Various injections are used; cold water, solution of sulphate of zinc, or of other astringent or stimulating salts, wine, or spirit. Wine is used pure or diluted. I have been constantly, from the commencement of my practice, in the habit of using port-wine without water, and have very rarely failed in effecting a cure. The strength of the wine is very variable, and more dependence, it is said, can be reposed on a solution of some astringent salt in water, (a drachm of sulphate of zinc to sixteen ounces of water is often used for the purpose;) but whatever the injection may be, the effects of it must be looked to, otherwise there is great risk of failure. The strongest-bodied, harshest port-wine, or a much stronger solution than that above, will in some cases produce not the least heat or uneasiness in the part, however long retained. There will follow no excited action, and no cure. Again, the injection will sometimes be found unbearable, and if persisted in, a great deal more action than necessary will ensue. Three or four ounces of port-wine should be injected by means of a small gum-elastic bottle, with a nozzle and stop-cock fitted to the canula. Some slight warmth and pain, running along the course of the cord, are complained of. The patient, perhaps, becomes a little faint. After retaining the fluid a few minutes, from one to four or five, it is permitted to escape, and a fresh quantity injected; this gives rise to an increase of the unpleasant feelings. The cavity is now emptied thoroughly, the surfaces rubbed slightly on each other, and the canula withdrawn.

If the patient complains very much of pain, the injection is retained for a very short period. If, on the contrary, he does not seem to feel even the second quantity, some stronger fluid should be substituted; and I have, again and again, in such cases of unusual insensibility, or where the disease has returned after injection with wine, properly conducted, thrown in a quantity of ardent spirit undiluted, the spirits in common use, whiskey or gin, and with the best result. The effect of this operation, and

that desired, is a certain degree of inflammatory action of the tunica vaginalis, a rapid swelling from effusion of coloured serum into the cavity, and of serosity also into the cellular tissue, connecting the various coverings and integument; a certain degree of thickening of the tissues adds to the tumour. The inflammation sometimes runs so high as to terminate in deposit of lymph. The painful feelings abate, the products of the excited action are gradually absorbed, and after a very short confinement, not entirely to bed, a permanent cure is obtained, and very frequently without any agglutination of the surfaces of the tunica vaginalis, or obliteration of the internal cavity. Sometimes bands and partitions divide it, and in others there is a complete adhesion throughout of the free to the reflected portion of the serous surface. In many cases, after the injection has been used, and the swelling of the coverings has abated, the tumour is found to fluctuate again; and it may be even observed to be translucent, but gradually the fluid disappears; the processes of exhalation and absorption now keep pace with each other, and the cure is complete and permanent.

CHAPTER XIV.

HERNIA.

It is highly desirable that every practitioner of medicine should fully comprehend the nature of abdominal hernia, should be well aware of its diagnostic signs, and be competent to afford relief before the symptoms have become of so urgent a nature as to indicate great and impending danger to life. Cases of hernia are much more likely to be treated safely for the patient, with judgment and skill, by the practitioner who is fully prepared to proceed to the last remedy when circumstances demanding it arise. It has been very truly said, that skill in operating is of the utmost importance in giving the surgeon perfect self-possession; a bad operator will hesitate in the most simple cases, whilst a good and dexterous surgeon, like a man skilful in the use of weapons, will not enter rashly into difficulties, but being engaged from conviction, will bring himself through with courage. Every young man then should endeavour to acquire some degree of dexterity in operating, for that will go far to make him a judicious surgeon.

The descriptions of the parts concerned in hernia, both oral and written, are too often encumbered by a number of technical terms, many of them meaning the same thing, or applied to parts of the same tissue, in such a way as to create confusion, and render those structures, and the changes produced upon them

exceedingly complicated, while, in reality, they are extremely simple and easily to be understood. The protrusions of the floating viscera take place most frequently from the lower part of the cavity, through the natural openings, which become more or less dilated, and they carry before them a pouch of the peritoneum, which contracts new attachments by cellular tissue to the natural layers, which line and cover the openings. In the male the most common form of hernia is that which descends along the spermatic cord. It appears first as a fulness in the region of the inguinal canal, and is apparent only in the erect posture, increasing upon muscular action. When the patient is desired to cough, an impulse is given to the fingers placed on the soft and elastic swelling, which generally recedes upon gentle pressure. By a continuance of the causes, which have induced the displacement of a portion of the lining membrane of the abdomen, and which does not again recede, but remains ready to receive any of the contained viscera, that may be impelled towards it, the sac is elongated, it bulges out below, like a flask, whilst the neck remains narrow and somewhat constricted by the resistance of the tendinous or membranous aperture through which it has escaped.

The descent of a portion of the abdominal contents may take place suddenly from violent muscular exertion, as in leaping, raising a heavy weight, &c. It is more frequently a gradual process. The parts may have been originally imperfect, the rings wide, and the surrounding parietes weak, the interlacement of fibres connecting the parallel fibres, not being so well developed as usual; but the best formed parts must yield at last to the constant impulse upon them from within, as by that caused in coughing incessantly, or straining very frequently to empty the bladder. A very great many of those who have laboured long under urinary disease, are also ruptured, not unfrequently on both sides. Hernia arises, however, very imperceptibly in many instances, and without the patient being aware of the exciting cause, and it has sometimes made considerable progress in its descent before attention is directed towards it. The

affection is met with, as might be expected, in those who follow particular trades or occupations more frequently than in others. A great many seafaring men, and a great many of those engaged in the keeping of horses, labour under hernia.

The most simple form of inguinal hernia is that in which the bowels come down along the natural passage into the scrotum. The descent of the testicle, and the period at which it occurs, is familiar to all; the mode in which it is invested by peritoneum on its fore-part, and covered by a loose reflected fold, how the neck of this protrusion is closed in almost every instance long before birth, is also well understood. But there are exceptions; the closure does not take place at all, or imperfectly, and the bowels descend, so that their peritoneal surface lies in contact with the serous covering of the testicle. The hernia named congenital is thus produced; the tunica vaginalis testis forms the hernial sac, and the natural coverings of the cord, thickened more or less by pressure, so as to afford support, of course invest its neck and body. The abdominal rings and canals are widened, and the epigastric artery is pushed a little to the mesial side and towards the spine. If the protrusion is permitted to continue, the natural obliquity of the canal during the development of the parietes does not take place, the opening into the cavity from the tunica vaginalis being short and direct.

The neck of the tunica vaginalis, again, is only partly closed at one point, and not throughout its whole extent. The tendinous openings are perhaps imperfectly formed, and a protrusion takes place before or soon after birth; the bowel does not in this case descend into the original process of peritoneum and come in contact with the testis, but a fresh protrusion precedes the bowel; the parts forming the cord are separated, and the neck of the tunica vaginalis lies on the anterior and inferior aspect of the new sac attached to it by cellular tissue, which becomes condensed, and intimately connects the outer surface of the two portions of peritoneum. This variety of hernia has been met with a few times in a state of strangulation in the adult, and has proved very puzzling and inexplicable to the surgeons engaged.

The first case of this kind which I happened to see was in the Royal Infirmary of Edinburgh, under the care of the late Mr. George Bell, in 1814, at which time I filled the office of house-surgeon of that institution. The patient was admitted with the usual symptoms of strangulation, which had existed for some days, and he had been brought in a cart more than twenty miles to the hospital, suffering extreme agony. There was no delay in proceeding to the operation; the layers were divided down to what was supposed to be the hernial sac; this was opened, and after the escape of three or four ounces of serum from a cavity shut at the top, a tumour presented, covered by serous membrane, resembling a swelled testicle, with an appendage, which really was the testis, at the lower part. The surgeon, a very cool and collected operator, as well as his colleagues, three or four experienced practitioners, did not know what to make of the appearances, and they retired to consult upon the further steps of the proceeding; upon returning, the swelling was cautiously cut upon, one layer was divided, and then a second, opening into another sac, and from this a quantity of serum also escaped; on enlarging the opening, a mass of omentum was exposed: the stricture was relieved, and a portion of the omentum removed, but in spite of free leeching the symptoms of peritoneal inflammation were not subdued, the bowels did not act, and the patient died within three days; no examination could possibly be obtained. A case very similar in all respects, excepting as regards the result, occurred to me about two years ago, in the North London Hospital, and is recorded in the "Lancet," vide vol. i. 1834-35, p. 883. The operation was not interrupted in consequence of the unusual appearance, although, without previous experience in the matter, there might have occurred a little delay in completing the proceeding. The patient made a good recovery, so that the intimate relation of parts in these two cases can only be gathered from what could be observed in dividing the tissues during the operation, only to the extent requisite to attain the object in view, viz. the relieving of the stricture and the return of the extruded parts.

Sir Astley Cooper, in his splendid work on hernia, has related

the dissection of a patient, communicated by Mr. Foster, in which the tunica vaginalis, distended with fluid, lay in front of a hernial sac, and extended nearly to the abdominal ring; upon cutting through the posterior layer of this tunic a sac was exposed and opened, containing a portion of intestine.

Mr. Hey, primus, of Leeds, has given a very accurate account of the dissection of a child, fifteen months old, in whom protrusion with relations similar to those above described existed, and he named it hernia infantilis, under the supposition probably that it occurs soon after birth, and to distinguish it from the ordinary congenital species. The diagram given by Mr. Hey's son conveys a very imperfect idea of what appears to me to be the relative situation of the different parts. Through the kindness of Mr. Wakley I am enabled here to give copies of the wood cuts which

illustrated a clinical lecture on the subject referred to above. The first is a copy, somewhat magnified, of Mr. Hey's diagram, the other represents probably the true position of parts.

The late Mr. Todd, of Dublin, has left some very excellent observations on hernia combined with hydrocele; he seems to think that the descent behind the upper part of the tunica vaginalis may take place at any period of life, and that the bottom of the hernial sac may form adhesions to the upper part of the tunic. When this cavity becomes distended with fluid, it will rise up and cover the fore part of the hernia, and he thinks that hydrocele is more likely to accompany this kind of hernia than any other, in consequence of the greater pressure upon the vessels of the cord. Hernia and hydrocele often co-exist, but the one tumour is generally situated above the other, and quite free from it, so that an opening can be made into either without any interference with the other.

The common oblique inguinal hernia, so named from its passage along the canal, is protruded in the cellular tissue enveloping the cord, and under its proper layers; the body of the tumour lies above and rather in front of the testis and its serous envelope. The vas deferens is often separated considerably from the other parts accompanying the cord, so that by the long-continued pressure in old herniæ these lie on either side, and even nearer the anterior than the posterior aspect of the neck and body of the sac. The epigastric artery and accompanying veins lie on the posterior and inner side of the neck, which is at first of some length, and is presented forming a swelling which passes obliquely from the outer side of the tuberosity of the pubes towards the anterior superior spinous process of the ilium, and of course above the ligament of Poupart. In herniæ of long standing and large size which have not been reduced, the neck is shortened, the apertures much enlarged and brought opposite each other, so that the obliquity of the inguinal canal in a great measure disappears. The proper layers covering the sac, together with the cellular tissue, are condensed and rendered much more distinct, more especially the cremasteric fascia, with which is generally incorpora-

ted the proper fascia, described by Camper as coming off from the external abdominal ring; under the integument is found a distinct and strong layer, enveloping the neck of the tumour and passing over its body; this is furnished from the superficial abdominal fascia; under this, after dividing some cellular tissue, appears the external ring with its superior pillar, and the interlacement of fibres connecting it to the ligament of Poupart, forming the lower border of the opening, or the inferior pillar; the tendinous fibres passing over the neck of the tumour can then be readily traced, forming a sort of sheath for the neck of the sac, rather than an aperture with defined edges. In connexion with this tendinous layer is another which has accompanied the tumour from within the tendon of the external oblique; the fibres of this cremasteric fascia, fleshy and tendinous, can be traced all over the swelling, and in old and large ones its thickness and strength are remarkable; under this again, and immediately investing the sac, is the extension of the funnel-like prolongation of the fascia transversalis, also rendered very distinct and firm. The hernia, besides the peritoneal sac, is thus provided with a layer of fascia from within the abdominal parietes, with one from without, and an intermediate one furnished from the muscles and tendons through which it passes. In many cases, the condensed cellular tissue may be, and is, in operations on the living body, often enough split up into various other layers, but to no good purpose.

Another form of inguinal hernia is that known as the direct, and it is very properly so named in consequence of its bursting through the tendinous expansion of the internal oblique and transversalis muscles immediately behind the opening in the external oblique. The neck of the tumour is, from the first, short, and the epigastric artery lies on the outer side; in fact, it is not at all displaced, but occupies its usual situation behind the abdominal layers and betwixt the two openings in them for the passage of the spermatic cord. This hernial tumour is unconnected with the cord, and is furnished only with one distinct layer, that from the superficial abdominal fascia; under this, some condensed cellular tissue, and the fibres

from the margin of the opening in the tendon of the external oblique, invest the sac. This variety is rare, in comparison with the oblique; it can be recognized, in general, by its form, the absence of any trace of neck extending towards the anterior spine of the ilium, and the more especially if examined when reducible: the fingers can then be passed at once into the abdominal cavity, and rather towards the mesial plane, carrying the integument before them.

The contents of the hernial protrusions at the lower part of the abdomen generally consist of a portion of the floating intestine, small or large, of omentum, or of both together. Sometimes the fixed portions of the colon slip down, their posterior cellular attachments behind being carried into the inguinal canal; a peritoneal sac invests the anterior aspect only, and, occasionally, even portions of the bladder pass out at the apertures in the parietes; these are rare cases, however. It does not appear to have been observed whether the portion of the bladder protruded consisted of all the coats, or whether it was only a portion of mucous membrane, extruded from betwixt the meshes of the detrusor urinæ, that found its way into the hernial sac; this is most probably the case. The protruded intestine, or omentum, is easily replaced, at first, by pressure, and in the recumbent position. It descends when the patient is erect and uses any muscular exertion. The tumour is distended when he is made to cough, and the increased fulness is appreciated by placing the fingers upon the part; pressure upon the openings in the tendons will prevent descent. When the sac is full, the cord cannot be distinguished. Such are the signs of this disease; the history will show that the swelling has come from above. The permanent protrusion of a small portion of bowel may not cause much uneasiness in any way, if the openings are pretty large; but if much of the intestine is thus deprived of the due support from the abdominal muscles, distension takes place, accumulation of flatus and fæcal matters, and the whole digestive apparatus is put, more or less, out of order in consequence. A careful observance of the signs, and attention to the history, will enable

the surgeon, under all circumstances, to decide upon the nature of the swelling, and to distinguish betwixt hernia and other scrotal tumours. The form, consistence, translucency, freedom of the cord, and opposite progress from below, instead of above, its constant presence, will mark the diagnosis betwixt hydrocele and hernia. The accumulation of serum in the vaginal covering of the cord prevents that body from being felt, and there may be some impulse communicated by coughing, when the tumour extends into the inguinal canal. The fluctuation, the form of the swelling, the history, will generally enable the surgeon to come to a proper decision. Sometimes hernia and hydrocele of the cord co-exist, and the symptoms of strangulation, in doubtful cases, have decided the question as to the course to be pursued.

Some years ago, I met, in consultation, two very judicious practitioners, Dr. John Thompson and the late Mr. Law, in a case of obstructed bowels in the person of an old gentleman. Dr. T. had seen the patient previously, and had given him advice as to a swelling in the course of the cord, which he had, after attentive examination, discovered to be hydrocele. The swelling had become somewhat painful, but scarcely any alteration had taken place in its form or size; the symptoms, however, having persisted in a violent form for more than two days, a farther examination into the nature of the tumour was warranted. An incision was made, very carefully, upon it. The hydrocele of the chord was exposed, but alongside of it lay a very small hernial sac, containing a knuckle of intestine in rather a bad state.

Solid enlargement of the testis, of any kind, is marked by its form, consistence, and progress. The appearance and history of hæmatocele, of anasarcous hydrocele, of the inflammatory œdema of the scrotum, can never be confounded with those of protrusion from the abdomen. Enlargement of the spermatic veins, cirsocele, is increased in the erect position, and upon exertion; when large, the swelling so caused receives an impulse from the action of the abdominal muscles. It disappears

in the recumbent position, and on pressure. The form of the tumour, and its feel, are as different from those of hernia as can well be conceived; the testicle hangs low, with an irregular soft swelling above it, composed of a congeries of vessels which can be distinctly perceived, both by sight and touch. The vas deferens can be easily felt. The swelling disappears on placing the patient recumbent and raising the scrotum, and returns quickly from below, upon gentle pressure being made upon the ring, in whatever position the patient is placed. A hernia, it is well known, cannot come down, if the finger covers the external opening of the inguinal canal.

The protrusion of the abdominal contents must not be permitted to continue. By returning them into their proper cavity, and retaining them with great care, there is a considerable chance, in many cases, of the openings contracting, and of the canal undergoing such alterations as will prevent further descent. This is more especially the case in young subjects, before the muscles are fully developed, and the canal has acquired its due obliquity. But, at all ages, it is desirable, even with the view of affording this chance, to prevent, with scrupulous attention, any, even the smallest, descent of recent hernia. I have met with repeated instances in which a person, well fitted with a truss, has been enabled, after a few months, to discontinue its use. It is highly necessary, besides, to keep up hernial protrusions, on account of the danger to which the patient is subjected from accumulation of the contents in the portions of the bowels which are extruded. This is frequently followed by engorgement of vessels and swelling of the viscera contained in the sac, in consequence of the obstruction thus caused to the return of blood. The tendinous apertures dilate very much, it is true, so that, in many cases, nearly the whole hand can be passed through them, but this is a very gradual process. But if anyhow, whether from accumulation of flatus and fæcal matters in the bowel usually contained in the neck of the sac, from accumulation in and distension of the venous vessels, or from further protrusion, a disproportion is created betwixt the contained and containing

parts, and impactment occurs, the patient is immediately subjected to a most distressing and alarming train of symptoms, and his life is placed in the greatest possible peril.

Hernia may, owing to several causes, prove irreducible. From its natural connexions, as already explained, it may be impossible by any means to return parts of the large intestine. Adhesions more or less firm and extensive, may have formed betwixt the serous covering of the protruded part and the interior of the hernial sac. To this has been attributed by Mr. Stevens, in a very ingenious book on the subject, the obstruction of the bowels, and he has proposed to make incisions solely with the view of separating these adventitious connexions, so as to permit the bowel to reassume its natural peristaltic action. It is not possible to predicate the existence, situation, or extent of adhesions; and upon the chance of discovering them, it will not often be prudent to resort to incision of the peritoneal cavity; the opening and exposure of which, whether from the entrance of air at a lower temperature than that of the body, or from the shock, is attended with greater danger than Mr. S. and many others suppose. Strong grounds must exist as regards the threatening nature of the symptoms, before an operation is resorted to. Should adhesions be discovered to exist in the hernial sac, I believe that they may more frequently be interfered with advantageously, to permit the replacement of the bowel, than is generally supposed or practised.

A loaded state of the intestinal tube may cause a temporary obstacle to the reduction of hernia. The descent of a greater quantity than usual, accumulation of fat in the mesentery or epiploic appendages, or a swollen or altered state of the omentum, may prevent reduction, either in whole or in part, and either temporarily or permanently. Again, the long-continued residence of a large mass of the abdominal contents in a hernial sac, with corresponding contraction of the cavity, may render impossible, or forbid the attempt to put them back. Some of the causes enumerated may be removed, others cannot; when only part of the viscera which have descended can be replaced, and no urgent symp-

toms are present, the tumour should be supported by a bag-truss, or by a truss with light spring and a hollow pad, according to the size and situation of the swelling. The further increase is thus prevented, and the displaced viscera perform their functions better in consequence of the gentle pressure. When the rupture can be entirely reduced, and let it be recollected that the sac does not return in any case, means must be taken to prevent a relapse. This is only necessary when the patient is erect and in exercise. A properly fitted truss, one made to press on the one or other end of the inguinal canal, or along its whole course, as the case may require, is applied before the patient gets out of bed. Great attention is demanded on the part of the machinist in proportioning the degree of pressure, and more especially in fitting the head of the truss to the particular case. A concave pad will be often found to suit well; it is occasionally necessary to fashion the compress so that the testis, which has not fully descended, may not be injured. Very frequently, a thigh-strap with a padding of a conical form along it, cannot be dispensed with, though in ordinary cases, the truss may be made so as to fit very well, and answer the desired purpose without this troublesome appendage. All varieties of trusses are to be obtained. The springs are differently arranged; some are double, so as to increase or diminish the pressure when shifted. In some, the head of the instrument is attached by a ball-and-socket joint, in others, made to shift with a slide and screw. The compresses are of all forms and consistence. They are generally stuffed with wool and covered with chamois leather, or they are formed of wood, of ivory, or of India-rubber. The simple truss well constructed, made for and fitted to the particular individual, with or without a thigh-strap, is to be preferred.

As has been remarked above, the protruded parts may become swollen from several causes, a greater mass than usual may have descended, and in either way, the contained parts may have become disproportioned to the capacity of the sac, and the size of the passage through the tendinous parietes in which its neck is lodged —to the neck of the sac itself, or rather the very condensed cel-

lular tissue immediately investing it. The membranous expansion and tendinous apertures are all very unyielding; they become dilated gradually, but they do not yield to any sudden impulse. The circulation of the bowel is impeded, and its functions interfered with, the interruption increases rapidly, both as regards the return of blood and the proper course of the fæcal matters. The patient becomes sick, the peristaltic motion is inverted, and the contents of the stomach and of the bowels above the protruded part are ejected; abundant fetid secretions, from the surface of the bowels and from the liver, are vomited with great suffering and distress to the patient. The powers of life are much lowered. Heat and pain, often intense, and increased on pressure, take place in the abdomen; the circulation is hurried, the pulse is sharp and wiry, the countenance anxious, and the bowels obstructed, but evacuations of the contents of the lower bowels may occur after the accession of the symptoms of strangulation.

If relief be not afforded, the confined bowel undergoes alterations which unfit it for again performing its functions. It is notched deeply where it has pressed against the strictured parts. It becomes of a dark chocolate colour and loses its contractility. The dark colour becomes deeper, infiltration takes place in the submucous tissues, sometimes purulent fluid is secreted, attended with thinning of the membranes. In other cases the coats become more and more thickened, the colour still darker, and the serous surface appears tender and broken in patches. At the same time that this occurs, and the contents of the bowel are in consequence about to escape into the sac, lymph is generally thrown out in abundance about its neck, so as to close the communication with the general serous cavity. The bowel within is often inflamed, and where notched by the stricture, is liable to ulceration. When it gives way at this point, effusion of the contents into the peritoneal cavity is followed by sudden aggravation of the symptoms, and a fatal termination very speedily ensues. In the advanced stage of strangulated hernia, the circulation flags, the surface is cold and clammy, the coun-

tenance becomes sallow and contracted, the features pinched, the breathing is laborious and quick, the nostrils in constant motion, the abdomen is distended, tympanitic and tender; the patient is distressed by constant vomiting and hiccough, and death soon closes the scene. The progress of the symptoms, as regards the rapidity and intensity of their march, is somewhat influenced by the bulk of the swelling, the size of the neck of the sac, and of the opening which embraces it; very much, also, by the quantity and nature of the protruded parts. The danger of rapid and prejudicial alteration upon the viscera involved, also depends upon these circumstances. In some cases of small hernia, where the neck is narrow, the symptoms are of a most acute kind, and the patient may be lost within a very few hours. Whereas in other cases, the accession of the symptoms is slow; they are not of an alarming character for a time, the bowels act, the vomiting is relieved, there is no pain or swelling of the abdomen, and no anxiety of countenance; exacerbations occur occasionally, but many days pass over before alarm is taken. The symptoms may be urgent, and the case altogether rapid in its unfavourable course, whatever the size of the tumour or openings; this is more dependent upon the bulk and condition of the contents, as already insisted upon, than upon the state of the canal. The presence of omentum in the hernial sac along with the bowel, often protects it considerably, rendering the symptoms less acute and the danger less imminent. It is to be kept in view, that obstruction of the bowels and peritonitis may very readily arise in a person who is subject to hernia, independently of strangulation; and it must also be borne in mind, that under many circumstances, the return of the portion of bowel which has descended, may be followed by an aggravation of the symptoms and an increase of risk, in whatever way that is accomplished. Hernia is a disease in which the utmost care must be observed, both in ascertaining the history and attendant circumstances, and in adopting means for relief. The diagnosis of the disease has already been given. It is first of all made out that there is actually a descent from the abdomen. Inquiries should be made as to the period at which

the rupture first appeared, as to whether or not it has been always reducible, whether reducible in whole or in part, when the entire reduction was last accomplished, when part became irreducible, whether or not means have been employed to retain the parts, and if so, whether the truss answered the purpose well or not. The cause of the recent descent, (very frequently tenesmus, from the action of medicine or bowel-complaint,) and the period at which it occurred, must be also ascertained.

If the patient is seen very soon after the rupture has come down, before any great increase in its volume, or any alteration of tissue can have taken place, little difficulty will in general be experienced in giving relief. But the tumour from the first may be very tense, the sac and the neck being as it were crammed full, and the surgeon may be disappointed—even although he be called within an hour or two after strangulation, symptoms of which appear simultaneously with the descent in such cases—in effecting the reduction so readily as he may have expected. He may even be foiled entirely, although if he understand his profession thoroughly this will not often happen. All obstacles to the replacement of the protrusion must be in the first place removed; with this view, the pelvis and shoulders are raised in order to relax the abdominal muscles, and the patient is kept in conversation so that he cannot expand his chest, and thus enable the muscles, by gaining a fixed point, to act forcibly. In inguinal hernia of any kind, it is not necessary to bend the thigh very much; but slight effect being produced, either upon the coverings or apertures, by any position of the limb. The object is, in the first instance, to diminish, as much as possible, the bulk of the protruded parts, and then to return them into the abdomen. With this view the tumour, if it fills the scrotum, is grasped with the hands spread out, so that the pressure may be uniform. This is persevered in steadily, the body of the hernia being brought as much as possible on a line with its neck; if very oblique, it is carried towards the opposite thigh; if direct, the tumour is raised, and pressure made towards the cavity of the abdomen. If the motion of fluid and flatus is perceived by

the touch, or made apparent by a gurgling noise, there is great encouragement for a continuance of this operation of taxis, as it is called; pressure is made gently with the points of the fingers at the neck of the swelling, and the surgeon will generally, if he sets about the proceeding with a wish and determination if possible to succeed, find his attempt after a time crowned with success. The patient will have instant relief from all his unpleasant symptoms; his nausea and pain will cease. The bowels will act naturally, or answer readily to gentle purgative medicine, and in a few hours, in general, all the effects of strangulation will have passed away. The continuance of bad symptoms, or the occurrence of a fatal result, are rare indeed, in comparison to what follow reduction after the best planned and most dexterously conducted operation. Circumstances will occasionally forbid perseverance in, or even recourse at all to, the taxis. The symptoms may have been of long duration, and may have become very intense; and there may be good reason to suppose, that unfavourable changes have occurred in the parts contained within the sac; that they may be in a state in which their restoration to the abdomen would be attended with an aggravation of all the symptoms, and would certainly lead to a fatal result. The taxis may have been employed and the attempt reiterated; the tumour, in consequence, may have become tender, and the surface may have run into a state of inflammation, as well as the deep parts.

A variety of measures are recommended even in the works of some practical surgeons, and in compilations for the use of students, as proper to be employed in order to relieve the symptoms or assist in the accomplishment of the taxis. General bleeding and baths according to the condition of the patient—his age, strength, and the duration of symptoms, being duly considered—are occasionally employed with advantage; their use is, by causing collapse, to favour the relaxation of the muscles which oppose reduction. The weak state of the patient or the urgency of the symptoms will often forbid any such measures being adopted: of the other means recommended, some are useless, others even hurtful—injurious of themselves, or from the delay occasi-

oned in their employment. The application of heat, locally by fomentations,—of cold, by bladders with ice, or by dashing cold water on the parts; the shaking of the patient with his head dependent, the application of pressure by a column of mercury, or the opposite course of taking off pressure by exhausted cupping-glasses over the rings, the exhibition of enemata,—are plans not likely to be followed with any advantage. External applications cannot well be expected to have the effect of suddenly relaxing the tendinous openings or membranous investments of the neck of the sac, nor of causing a diminution in the bulk of the protruded parts, so long as the obstacle to the course of the fæcal matters, and to the return of blood, exists. Even could fluid be made to pass readily through the intestinal tube from below the obstruction, it is not likely to be thus removed by the disengagement of the parts. Purgatives, antimonials, and tobacco-enemata increase the mischief, and diminish materially the chance of the patient's recovery. Local abstraction of blood by leeching, a most beneficial practice in inflammation of the contents of a large hernia without strangulation, is of no use in this state.

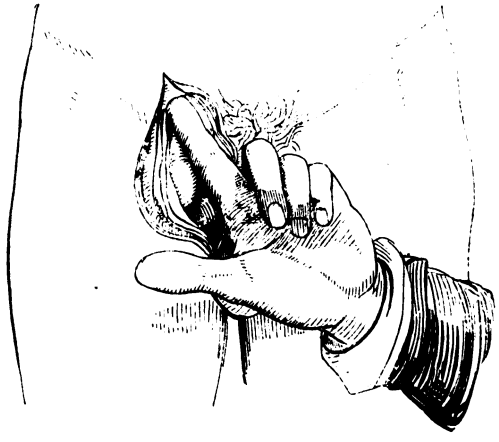
Should the taxis, perseveringly and judiciously employed, favoured or not, according to circumstances, by bleeding or warm bath, fail, there ought to be no delay in proceeding to relieve the patient by surgical operation; there is some slight risk attendant upon the proceeding, but there is still greater danger in delaying it, and permitting those frightful changes upon the contents of the sac, as well as upon the viscera contained within the abdomen, with their almost inevitably fatal consequences, described a few pages back, to ensue. Mr. Hey, a most experienced and judicious surgeon, long ago remarked that he never had reason to regret having recourse to operation too soon, but he had frequently occasion to observe the fearful effects of delay in such cases.

Operation.—The patient should be placed on the edge of his bed, or on a table of convenient height; the parts, previously shaved, are put upon the stretch, the tumour being grasped behind by the left hand of the operator. An incision is commenced

above the inner opening, through which the protruded parts pass, and is carried down over the middle of the neck and body of the swelling. In hernia occupying merely the canal, the incision should extend from above the internal opening to the further extremity of the swelling; in scrotal ruptures of small size, it should be carried nearly to the bottom; but in larger tumours, and those more especially which have not been wholly reducible for some time, the opening should be limited almost entirely to their neck. The reason for laying down these rules must be obvious; it is necessary that the seat of stricture should be attained, so that it may be removed without danger or delay; but if the sac is opened, and that to a great extent, and it is found impossible or improper to attempt the reduction, then the contents would be left exposed and unsupported. The first cut is made through the common integument and fatty matter with a scalpel or bistoury held lightly in the unsupported hand, either in the position represented at p. 9, or in the more constrained manner of a writing pen; the superficial abdominal fascia is then also divided, as may be the second layer in succession, the cremasteric fascia with the conjoined fibres from the opening in the tendon of the external oblique; the prolongation of the fascia transversalis—the immediate investment of the peritoneal sac, will thus be exposed; these layers may all be incised, one after the other, with the hand unsupported, by a person in the habit of using the knife constantly, who can do so with steadiness and precision; dissecting-forceps may be used in lifting them, or they may be scratched through at one point and a grooved probe introduced into the opening, so as to separate one from the other. The division is made by pushing the back of the knife along in the groove of the director: this is the safe course for a young operator to pursue; the three proper layers, and a good many more if the director is used, are divided, and the sac exposed. The operator will now, having made up his mind previously, either attempt to relieve the stricture by careful incision upon the neck of the sac, or he will open the cavity with great care, and proceed, according to circumstances, to divide the stricture and dispose of the contents; if he has deter-

mined upon the former course, he will proceed to incise the deep layer, the funnel-like process of the transverse fascia, which he has opened, together with the superior pillar of the ring, by slipping a blunt-pointed narrow bistoury, slightly bent, betwixt this sheath and the neck of the sac, and turning its edge forwards and upwards; he will thus cut the resisting tissues to a sufficient extent, and in a line parallel to the linea alba; the reduction of the contents of the sac may then be attempted, and if successful, one great danger of the operation, that arising from the exposure of the peritoneal sac, the lowering of its temperature, and the consequent shock upon the system, is avoided. But even in favourable cases there are difficulties to be encountered in accomplishing this very desirable object; the constriction is caused by a condensed cellular and fibrous tissue immediately investing, and incorporated with, the serous cyst. The stricture may in point of fact be said to exist in the neck of the sac itself, and this must be cut before the contents can be returned. In many cases the reduction is impeded by adhesions, and by entanglement with omentum; it is desirable, in cases where the strangulation has existed any considerable time, to ascertain the precise condition of the protruded parts, and to consider, after careful and actual inspection, whether they should be returned or not. If the sac is to be opened, it should be effected with due precaution and care; generally some fluid is present along with the viscera, some dark-coloured serum, and the sac does not closely invest the contained parts; the membrane should be pinched up betwixt the nails of the fore-finger and thumb, and cut to a slight extent, the blade of the knife being laid along the surface horizontally. The point of a blunt-pointed bistoury, guided by the finger, is passed into the opening, and the sac, together with the layers, slit open, and nearly to the extent of the wound in the integuments. The surgeon must be prepared to meet with and overcome difficulties in his progress. The layers are condensed, there may be such an arrangement of parts as described and delineated p. 439; the sac or its immediate investments of cellular and fibrous tissues may be enormously thickened. Through the kindness of my friend, Mr. John Maitland,

Westminster, I am in possession of a sac nearly two lines in thickness, coated internally by a layer of firm, organised lymph. The hernia may be direct, and the layers few in number, in fact, only one perfect, so that the sac is reached at once, and might be opened by a slap-dash operator for one of the fasciæ. The sac is intimately connected to the bowel or omentum in some cases, and great care is required to avoid wounding these parts. Supposing that the sac is opened and its contents exposed, these are unravelled and examined; if comparatively sound and reducible, nothing in their connexions or condition to forbid it, the stricture is forthwith divided; this is done upon the guidance of the fore-finger of the left hand thus; the narrow part is felt,



whether seated opposite the external ring, or opposite what has been called the internal one, the commencement of the inguinal canal; the bistoury is placed with the blade flat, the edge, after it is insinuated under the narrow part, being brought to bear upon it by raising the handle, the fulcrum being on the point of the finger.

In all cases, whether the hernia is oblique, common, congenital, infantile, or direct, the division of the stricture is made in the same direction, viz. parallel to the linea alba, with the view of avoiding the epigastric artery, which will thus be safe, whether

it runs inside, as in the former, or outside, as in the latter variety. Sir A. Cooper, and latterly Mr. Key, have advised that the neck of the hernial sac should not be cut, that the bistoury should be pushed outside the serous membrane, still guided by the finger within; this part of the proceeding is rendered complicated and uncertain, without any great counterbalancing advantage. If the peritoneum be opened, the incision of half an inch, more or less, can be of no consequence, and, as already remarked, the stricture in the majority of instances cannot be relieved without cutting the neck of the sac in which it is truly seated. After this is effected, as ascertained by the finger passing freely into the peritoneal cavity, the reduction is to be commenced. For this purpose, it is as necessary as during the attempts to reduce by taxis, to remove any obstacle to the return, by position, &c. It will be found of the utmost consequence besides, to fix the sac firmly; for this purpose an assistant should be directed to place his fingers in the bottom of it, whilst the surgeon proceeds to his task. In the first place, the bowel should be emptied of its contents, and perhaps a small additional portion may be with advantage pulled down, so as to expose the parts which have been indented by pressure against the stricture; the whole mass is then gently squeezed with the fingers expanded, and the flatus and fluid contents pushed back into that portion of the canal within the general cavity. This being effected, the part is slid back, bit by bit, until the whole is returned; the omentum is then disposed of. It may be unchanged to a great degree, and is easily pushed back. It may be adherent, firmly and intimately: there it may remain. It may be so tuberculated that it cannot or ought not to be returned. It will be better to leave it in the state and place that it has occupied, probably for years, than to cut or tie it off. It is recommended by some writers that the omentum should first of all be returned, but this is not generally possible in actual practice; the bowel has come down last in the majority of cases, and gives rise to all the disturbance, whilst the omentum has probably

been resident there, more or less, for a considerable period. The whole of the bowel may not be reducible in consequence of its natural connexions, or of intimate adhesions.

Supposing that the reduction has been effected satisfactorily, it will be proper to adopt means to prevent escape of any portion of the viscera, and a neglect of this precaution has led to unpleasant consequences. A compress or two of sufficient size are to be placed over the wound, first put together by a few points of suture at the upper part, and secured by the turns of a double-headed roller passed round the pelvis and thigh repeatedly, and crossed neatly over the point where pressure is essential. The wound must be left open below, and the scrotum supported, to prevent the breaking up of the cellular tissue of the scrotum by the effusion and accumulation of blood. This I have known happen to a very alarming and dangerous extent, for it is sure to be followed by unhealthy suppuration and loss of integument and other tissues. It has happened that the intestine has been wounded in dividing the stricture. A very good case is related by Mr. Lawrence in his "Treatise on Ruptures," in which the opening was pinched up and surrounded by a ligature. The ends are cut short, lymph is effused around, and the threads cut their way into the bowel, and are discharged. The same practice is applicable to slight incised wounds from other accidents. If the bowel be in a mortified state, the stricture ought, if necessary, to be divided without disturbance of the adhesions, and the free exit of the contents provided for. Astonishing recoveries have been made after the loss of considerable portions of small intestine; the further from the stomach of course the better the chance of the patient being nourished sufficiently to sustain the cure. The explanation of the process by which the tract of the intestinal tube is restored is admirably given by the illustrious Scarpa. The efforts of nature may be somewhat assisted by judiciously applied pressure. The destruction of the septum by means of the gradual approximation of the blades of forceps, as practised by Dupuytren, may hasten the cure, though at some hazard to the patient, there being no small risk of exciting in-

flammatory action in the abdominal cavity. It is now ascertained that cutting for rupture is not followed by a cure, and that a truss is as essential after as before the operation.

Inguinal hernia is met with in the female in the oblique form, but not very frequently; the openings in the parietes and the canal itself being small, and in proportion to the ligament passing through them. When recent, the tumour occupies the groin above Poupart's ligament, and as it increases it descends into the labium pudendi, covered by the common integument, and the same layers as in the male, though not so distinct or fully developed. A little difficulty has been occasionally experienced, greater in patients loaded with fat, in distinguishing betwixt this hernia and that which passes under the ligament of Poupart. The crural descent is turned up so as to overlap the lower part of the abdominal parietes, but it can be depressed towards the thigh so far, and the course of the ligament traced satisfactorily. The same treatment in all conditions of the disease in the female is necessary as for the other sex, and the same steps and precautions observed in the operation.

Femoral hernia is a disease to which both sexes are liable; the female, however, more frequently by far. In the male it is an exceedingly rare occurrence. It may here be considered with propriety as occurring in the female, and any peculiarities in treatment adverted to cursorily in the proper place. The greater size of the space betwixt the femoral vessels and the tuberosity of the pubes, under the ligament of Poupart, what is called the crural ring, may account for its more frequent appearance in the female. The tumour presents itself as a small round elastic knob in the hollow of the thigh, inside the femoral vessels; it is seldom larger than a small orange, but occasionally it attains, even in the male, a very great bulk, spreading upon the thigh and over the lower part of the iliac region of the abdomen. The existence of the descent is often concealed through motives of delicacy, and great suffering is endured from time to time, perhaps without the patient being fully aware of the cause, or so far unwilling to believe that the symptoms arise from the presence of the

swelling. The tumour is reducible or irreducible, in part or in whole; very frequently indeed a portion of omentum remains always down, and a knuckle of bowel slips in occasionally on violent exertion. When the existence of crural hernia is made known, means should be taken to retain it, and a truss without a thigh-strap, if possible, should be carefully fitted for the purpose of preventing its recurrence. If part is irreducible, a concave pad may be worn with safety and advantage. The symptoms arising from confinement, and swelling of the bowel, are the same as already described, but their progress and severity are generally more rapid and intense, owing to the smallness of the aperture, the unyielding nature of the tissues composing it, and the sharpness of the edge against which the contents of the sac are pressed. The same, or even greater, necessity exists for prompt interference in strangulated crural hernia. The taxis should be perseveringly employed, and with proper precautions. The same position of the trunk as in reducing inguinal hernia is observed; but besides that, the thigh should be fully bent and rotated inwards, in order that the crural ring may be more fully relaxed. The pressure should be made with the points of the fingers spread around the tumour, so that it may be uniform, and calculated to diminish its volume; it should be at the same time directed towards the centre of the thigh, towards the lesser trochanter, as it were, the object being to depress the body of the hernia, to pull it down from the tendon of the external oblique, over which it is turned upon itself, and bring it into a line with its neck. Should the taxis fail, assisted, if thought proper, by general bleeding and warm-bath, one or both, no delay is admissible in having recourse to operation. The descent takes place through the space betwixt the femoral vein and the crescentic portion of the crural arch, and it emerges on the thigh through the opening in the fascia lata, and at its separation into iliac and pubic portions for the entrance of the saphena vein. The peritoneal sac, in passing down through the cribriform fascia, carries a layer of this condensed cellular tissue before it, which forms its proper sheath. This is strong and dense over the neck

and body of the swelling, at the fundus it is weak and often deficient; in fact, one or more of the natural openings, in the fascia, against which the parts have been pushed, and which has been protruded before the sac, have been extended. More superficially, the hernial tumour is covered by what has been called the loose cellular fascia of the groin, a tissue involving the lymphatic glands, and some small venous branches. The neck of the sac is immediately invested outside of its fascia propria by the crural arch—a very strong band of fibres, the formation and relation of which were, I believe, first clearly pointed out by me, (1819,) in a memoir on the subject. This band is formed by the junction of the external and internal fasciæ of the abdominal muscles, with the fascia lata of the thigh. It lies immediately under, parallel to, and connected by condensed cellular tissue, with the ligament of Poupart. This ligament, together with the lower border of the muscles, can be removed, still leaving the fascia superficialis abdominis and fascia transversalis joined to the iliac portion of the fascia lata of the thigh entire, and forming a firm resisting arch over the femoral vessels, attached to the spine of the pubes, and forming a sharp and defined edge. It is this part which causes the stricture; and the opening, from its connexion with the covering of the muscles of the thigh, is stretched when the limb is extended and rotated outwards. It is relaxed in a remarkable manner when the limb is placed in the opposite position. Thus are explained the directions formerly given for placing the patient so as to favour the return of the descent by taxis.

The operation for femoral hernia consists in dividing the superimposed integument and fatty matter, so as to expose the fascia propria and sac. The incision through the coverings may be made, as recommended by our greatest modern authority on this and other surgical subjects to which he has directed his attention, Sir A. Cooper, in this form. | I have, for some years, preferred an incision along the line of Poupart's ligment, with another falling from its middle over the body of the

tumour, thus for the right, or thus for the left side.

The parts are in this way more fully exposed, and the discharges escape readily at the extremity of the lower incision, the adhesion of the greater part of the wound not being interfered with. These are made by cutting from without; or, what is better, as causing less pain and being more safe, should the patient be restless and not easily restrained, the skin may be pinched up betwixt the fingers and thumb of the surgeon and assistant, and divided by passing the knife through the fold, with its back towards the sac. The cellular covering of the tumour is raised with the forceps, and divided with care; the fascia is thus exposed, is opened into on the prominent part of the swelling; and its thinness or deficiency at the lower part must not be lost sight of. If the surgeon aims at trying to give relief without opening the sac, he may now pass his narrow, blunt-pointed bistoury betwixt it and the fascia, upon a director insinuated under the sharp and tight edge of the crural aperture; turning the edge forwards, and slightly towards the mesial line, and raising its handle, he will divide the resisting fibres. He may now try to reduce the contents of the sac by pressure, in which, in nine cases out of ten, he will fail; he is much more likely to succeed in pushing back sac and all—rather a serious accident. This plan was advocated strongly, long ago, by Petit and Monro, secundus, and latterly revived and practised, in a few cases, by Mr. Key, senior surgeon of Guy's, and his colleagues. Some objections have been stated to this practice, as applied to inguinal hernia: they apply with greater force here. It is rarely possible to effect the object, although there is no harm done by trying it in some cases; but in others, constituting the vast majority, it must be very unsafe. There is a risk, as noticed above, of returning the sac with its contents, in which case the strangulation would not be relieved, as I know from experience. It is almost always necessary to examine the bowel, to pull it down a little, and empty it of the accumulated matter, thus removing, in some measure, the notches in it caused by the pressure on the sharp

edge of the ring, the continuation of which often leads to a fatal result, after the return of the parts, however sound otherwise; it is besides now and then advisable to leave the parts unreduced. In all cases in which the strangulation is of some duration, the sac should be exposed, by the division of its proper covering, and opened; this requires some degree of delicacy and tact. The fascia and sac are to be carefully distinguished. The serous membrane is not often thickened, but accumulation of fatty matter sometimes takes place, to a great extent, on its outer surface, and may obscure, not a little, the appearances of parts. The sac, though thin, may be in close contact with the contents: there may be little or no serosity in it, or it may be glued to them by a layer of lymph. The circumstances are so various, both as regards the condition of the containing and contained parts, that great circumspection is demanded in every operation of this kind. The sac being opened slightly, in the manner already indicated, by pinching up a little bit and dividing it with the knife laid flat upon the surface of the tumour, is slit up with the blunt-pointed knife, to its full extent.

I operated on a case, a few weeks ago, in the hospital, in which there was no possibility of pinching up the sac, either with the fingers or forceps; it contained no fluid, and was impacted most firmly with bowel; very luckily, the membrane was thin; and, observing a pelleton of fat underneath, I scratched very cautiously with the point of the knife in the unsupported hand, until a trifling puncture was made, sufficient to admit the blunt point of a narrow bistoury. Omentum may be looked and felt for, in such a case, in choosing a part to make the opening; here there was none. The fore-finger is the best and safest guide for the bistoury in reaching the stricture. The nail of the left or right, according to the side operated upon, is passed within the sac, and to the edge of the ring; the pulsation of any vessel immediately behind it would thus be felt. The circumstance of the obturator artery, or of a large anastomosing branch betwixt that and the epigastric, turning round the opening which, in some instances, embraces the neck of the sac, is not to be lost sight of. In

operating upon the male, the presence of the cord on the fore part of the crural ring, and, in the female, of the vessels forming the round ligament, need not disconcert the operator. In no case is it necessary to divide many fibres in order to relieve the stricture, and these are only the fibres of the crural arch. The ligament of Poupart, which forms the lower pillar of the external abdominal ring, lies betwixt the stricture and the inguinal canal with its contents; it has nothing to do with the formation of the stricture, and is of course left untouched. The probe-pointed knife is entered not more than a line, and its edge turned forwards and inwards towards the tuberosity of the pubes; the fibres are felt to yield, and the finger passes on so far. The neck of the sac is very narrow, and the serous membrane composing it is supported and embraced very tightly by condensed cellular tissue presenting a fibrous appearance; if any shred of this is left, the reduction cannot be accomplished. In operating on an old lady, in the neighbourhood of the hospital, one evening in the course of last winter, I had, as I supposed, sufficiently relieved the stricture, and tried, ineffectually, to pull down or empty the portion of bowel. On passing the finger along it, the cause of the difficulty was discovered to be a single fibre, like a sewing thread, but very strong and indented into the gut.

The division of the stricture being satisfactorily effected, the parts, if sound, are returned. The patient's body and limb of the affected side are placed as in the taxis, and this must not be overlooked, otherwise a great deal of delay may arise in completing an otherwise well-performed operation. The bowel is emptied and replaced with gentleness, a point or two of suture inserted, and means taken to prevent a future descent. After the operation for hernia, the attention of the surgeon must not be relaxed. The patient may probably have instant relief in his bowels, the vomiting may cease and the tenderness abate; the constitutional disturbance will also disappear; but, in many cases, and from various causes, the course of events is by no means so favourable: the obstruction is not relieved, and the symptoms continue. In the first instance, the treatment should

consist in exhibiting copious enemata, by means of Read's syringe, undoubtedly the best, neatest, most simple and efficient instrument of the kind. This, after some hours, will be followed by calomel, by other purgatives, by medicines calculated or meant to allay irritability of the stomach. It is often advisable to apply a number of leeches to the abdominal parietes, in order to avert or relieve inflammatory action. Fatal terminations often follow, in consequence of the general disturbance of the system or of the local mischief. The bowel may give way and effusion occur into the peritoneal sac, or the part which was down does not resume its functions, has lost its contractility, is, in fact, paralyzed; or the fæcal matters do not pass onwards, in consequence of the permanent narrowing of the gut where it was nipped against the edge of the opening; or inflammatory action runs its course, in spite of all that can be devised to moderate it. Or, again, the patient may have had his powers of life lowered by previous mismanagement; he may have been nearly poisoned by tobacco, or other drugs. I have seen the operation undertaken when the state of collapse was so great that scarcely a drop of blood oozed from the incisions, and the patient was then not slow in dying.

Umbilical and ventral herniæ, when observed, must be retained by proper apparatus. The openings through which they pass are large, and strangulation unfrequent. If operative procedure is demanded, and the tumour large, as is usually the case, the incisions should be limited and confined to one side, that most removed from parts of importance; a very small opening only should be made, and the stricture relieved, so that the parts may be returned, if practicable and advisable, or, at all events, the effects of the constriction removed. The incision, in umbilical hernia, is made on the lower surface of the neck, and in the linea alba. No surgical interference can take place in cases of protrusion through the openings in the diaphragm, through the obturator or ischiatic foramina, or in other rare internal displacements.

CHAPTER XV.

CONGENITAL DEFICIENCIES AND DEFORMITIES.

To enumerate the various congenital deficiencies and monstrosities, far more to attempt to account satisfactorily for the imperfect developement of the fœtus in utero, for the extraordinary malformations and transposition of organs, for the additions which are made in the form of marks, tumours, and imperfect organs, or for the junction and blending together of parts of two or more individuals in the same mass, would be a most difficult undertaking, and out of place here. Many of these freaks of nature, as they have been called, hare-lip, mother's marks, &c., are accounted for by the vulgar, and believed by many, to be the result of some powerful impression made upon the mind of the female after conception. The same sort of deformity is often met with in several children of the same parents; perhaps in those of one sex only. I have repeatedly treated several cases of hare-lip and of club-foot in the same family, and two of the sketches which illustrate the following remarks, were taken from a family of four, upon whom I operated on the same day, in the Royal Infirmary of Edinburgh. The mother stated, that her husband, during her first pregnancy, had brought her home a leveret as a pet. It became very tame and familiar, and her neighbours and gossips used to tell her that her child would have a mouth like the hare. Her first-born, a male, was brought into the world with a very bad double fissure of the lips and palate, the others

appeared in due time similarly deformed, thought o a less extent; in fact, every one differed from the other in some respects, and the operations were modified accordingly. One perfect child, by the way, which did not survive long, was produced in the interval betwixt the two youngest brought to me for operation. Every practitioner must have had the same sort of stories told him about similar cases, many of them, perhaps, not thought of until after the appearance of the unfortunate animal, and not at all worthy of credit. Many of these connate malformations can be remedied by the art of surgery when well understood. The proper mode of proceeding and the period at which the attempt should be made in the various instances, will now be considered.

Puncturing the cranium in chronic and congenital hydrocephalus need not here be noticed. There is no difficulty in the matter, and no good likely to accrue from it. The same may be said of interference with those membranous projections filled with serosity from betwixt the cranial bones, and which often form large projections on the forehead, or occiput. The orifice formed by the eyelids is sometimes too small, and contracted by a membranous slip at either angle. This can readily be divided by passing a bent sharp-pointed bistoury under it; the fissures are occasionally misplaced and drawn towards the temples, a large space appearing betwixt them; the vision is thereby rendered imperfect. The deformity and inconvenience can often be remedied by the removal of an oval slip of integument from the mesial line over the glabella; the size of the portion removed must depend on the extent of separation. The edges of the integument are forthwith to be put together by one or more points of suture; a few narrow slips of plaster are applied some time after, and in twenty-four hours the threads may be removed. Ptosis, falling down, or depression of the upper eyelid, may be the result of paralysis of the levator muscle or of looseness and relaxation of the integument. This is natural, or the result perhaps of inflammatory œdema. Benefit occasionally accrues from the removal of a fold of the relaxed integument. This is sometimes effected by the employment of escharotics. The excision of the part is more exact and less painful. A fold is

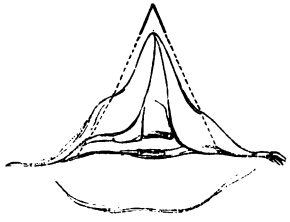
pinched up and held in a pair of flat-mouthed forceps, and with a fine knife an oval piece is excised. The edges are then put together by one or two points of fine interrupted suture. The lid is thus permanently elevated, but in such a way that the patient can expose or shut the lids at pleasure. The heavy look and the imperfection of vision are removed.

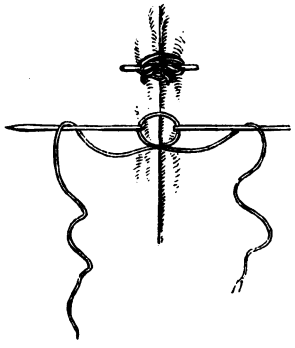
Fissures and deficiencies of the lips and of the superior maxillary and other bones, are constantly met with in a variety of forms. The simple hare-lip, without any imperfection of the osseous structure, is here shown, and this should be so treated that, upon close examination, the slightest possible line can only be detected; very generally the operation is imperfectly performed, the edges are not properly pared, and the rounded margins, where the membrane that covers the edge of the fissure joins the true prolabium, not removed to a sufficient extent. A notch is still left at the lower part, the scar is broad, puckered, and uneven; the teeth are exposed, and attention is at once painfully attracted to the part and to the individual so affected. Many patients are scarcely if at all benefited by the attempt, conducted in this slovenly manner, and often at a later period of life they are found very anxious to have the unseemly cicatrix taken out by a second operation; not a year passes over without several such cases being presented to me, both in public and private practice. The extent of fissure is very various in different individuals; whatever that may be, it may be pared and its edges laid together smoothly by adopting a proper method.

The operation may be performed at all ages, but it is generally advisable to delay interfering until the child has attained the age of two and a-half or three years, or, at all events, until the greater number of the temporary teeth have come through the gums. In bad cases, some of the teeth, with the alveolar processes, must be removed before uniting the lip, and the child will at this period be better able to bear the proceeding. From two to four years is certainly the time to be preferred, but the operation is often

necessarily performed much later on children, and also on adults, yet the parts accommodate themselves well, and the deformity is greatly obviated. A vast variety of forceps and scissors have been contrived for holding and cutting the lip. The fingers best answer the first purpose, and a plain, narrow, sharp-pointed bistoury will serve the other. The surgeon has the child wrapped and pinned up in a large cloth—so that the hands and feet may be perfectly confined and all struggling prevented—placed on the knee of the nurse. This is an admirable mode of managing children of maturer growth about to be operated upon, if their steadiness cannot be relied upon; they are thus made most perfectly secure, and rendered so helpless, that the proceeding may be completed without interruption, and with much saving of pain and blood. The surgeon secures the head betwixt his knees, and seizing one corner of the lip with one hand he enters the point of the knife above the corner of the fissure close to the nostril, or even within it in some cases, and pushing it through the lip, he runs the instrument downwards in its substance, so as to pare off the edge completely, as seen in the diagrams. The opposite side is laid hold of, and the bistoury, entered again near the first point, is slid along so as to make that also raw. The incisions must be so planned that they shall be as nearly as possible of equal length. It has been proposed to make them slightly concave, in order that the lower part might project a little, and thus have a more natural appearance. The position of the surgeon is behind and above the patient, and in operating upon adults, he stands behind the patient seated on a low chair; the incision on the left side is made with the right hand, that on the right with the left, or the left hand may be so crossed over, although awkwardly, so as to lay hold of either flap, and the right hand used throughout in cutting. After the edges are thus made fresh, the slips are to be cut out from the upper angle; they are for this purpose laid hold of in the fingers, or with a pair of dissecting forceps, and the edge of the bistoury turned against them, so as to make the two incisions unite at a very acute point. I have latterly made this part of the incision first, and then transfixed

on one side, then on the other thus. The incisions being completed, the edges must be brought together with neatness and accuracy, so that there shall be no puckering, or over-lapping, no rising of one surface over the other, no notch or deficiency at the lower edge, and no space for the accumulation of blood betwixt the cut surfaces. These indications cannot be fulfilled by any plaster, and very inefficiently by the interrupted suture. The sutura circumvoluta, or twisted suture, is the most effectual. The old-fashioned, clumsy hare-lip pins of silver or gold, with moveable steel points, and the porte-aiguille, for their introduction, are, it is supposed, scarcely ever now employed. I have been long in the habit of using sewing-needles of different sizes, with heads made of sealing-wax, to facilitate their application; latterly I have used extensively, and prefer much, long rounded needles, made purposely, with sharp spear-points. These are entered very easily without a head in any direction that is desirable. Two needles are generally necessary to bring the parts neatly in contact; one alone will seldom be sufficient, and it is not often that three are required. The first should be passed close to the free margin of the lip, through two thirds of its thickness, and it ought to be so placed that the prolabium on each side shall be perfectly on a level. The second needle may then be passed midway betwixt the first and the top of the fissure. Thick stay-silk, well waxed, is then turned round the pins and secured as shown above, and their ends cut short with nippers. If the threads are crossed from one pin to the other, in order to lay the edges more smooth, care must be taken not to approximate the two points of suture. No dressing ought on any account to be applied; it may

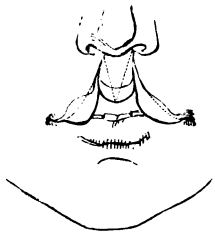




do harm by retaining secretions, and heating the wound; it can do no good. The pins may generally be removed with safety and propriety at the end of forty-eight hours; the threads adhere for some days longer; a strip of isinglass-plaster may now be applied, if thought advisable, from one cheek to the other over the threads.

The variation in appearance and extent of deficiency in double hare-lip is very great. The fissure may be short and the interposed slip long and free. The bones may be found sound and perfect; or, again, the spaces are wide, the nostrils are as one cavity with the mouth, the intermediate portions of the superior maxillæ (ossa incisiva, as they may here properly enough be called) project, and push the portion of lip before them, so as to come in contact with the tip of the nose. This portion is often short, and firmly incorporated with the bone. From the piece of bone, thus awkwardly placed, forming the anterior extremity of the septum narium, the central incisors in general grow out very irregularly. The operation for uniting the double fissure must be varied very much to suit the circumstances. In the more simple form, the one side is pared first, as described in speaking of the simple fissure; then the other, and by passing needles across the two wounds and through the interposed slip, they are at once put together neatly and effectually.

This is always preferable to the plan recommended, and I believe very generally followed, of performing two operations, and at different periods, with an interval of some weeks or months, first uniting one side to the flap, and when that is consolidated, uniting it to the other. Neither of these methods can be followed unless the slip is long, and the free margin of it comes readily on a line with that of the lip, so that the prolabium shall be perfectly straight. When the intermediate portion is short, then it can be made available thus; the apex of it is cut so as to

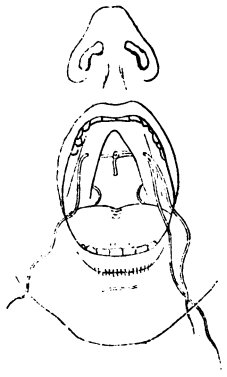


form an acute angle, and the upper pin is passed through it, whilst the lower connects the two sides of the lip. In every case it will be advisable, previously to paring the lip, to remove any tooth or teeth that by their malposition might interfere with the union, or by their projection cause deformity. Again, when the bone projects very much, and the soft covering is very short and adherent, it will often be better to take them away together at once; the part is surrounded by an incision, and a small pair of cutting-pliers employed. The case then becomes one of single fissure, though not of the most favourable kind, but by judicious and careful management an admirable cure can even here be accomplished.

It is very seldom indeed that the adhesion fails at any point if the parts are accurately opposed and retained. I have met with but three cases of disunion out of a very great number operated upon, at all ages and under all circumstances, favourable or unfavourable. In two, it was the result of accident; of a severe blow on the part within a few days after the removal of the sutures. In the other, the separation was immediate, and the failure of adhesion attributable to the state of the child's system. The boy had but just recovered from an attack of scarlatina, of which I was not aware, being on a flying visit at the time, and there being still patients labouring under the disease, and its sequelæ, in the same house.

The velum palati sometimes is found entire, though the bones are so far deficient, and *vice versa*. In general the fissure extends through both, causing difficulty in receiving nourishment. Many children are imperfectly nourished, and perish in consequence. When the individual grows up, he still finds an effort necessary to prevent food from passing through the nostrils, and his articulation is very indistinct and disagreeable. In the majority of cases the patient must content himself with having a plate of metal properly fitted to occupy the space, and this may be constructed with a movable portion behind, or not, as circum-

stances seem to demand or permit. Occasionally cases present themselves in which the space is not very wide betwixt the two portions of the velum and uvula, and the deficiency of the hard palate is not considerable. At a proper age, when the patient, having attained the years of discretion, is willing to submit to some pain and inconvenience, to afford every facility for the accomplishment of the operation, and to throw no obstacle in the way of the union, an attempt may be made to bring that about. It is only, however, in very favourable instances that this velo-synthesis should be attempted; for if the edges do adhere in part, and are put upon the stretch, the patient is not much benefited, if at all; he is not by any means rewarded for all his pain, anxiety, and self-denial. The muscles of the velum cannot act even so perfectly as before, and the proceedings of the dentist in fitting an artificial palate are rather interfered with than otherwise. When everything is favourable, and the operation is determined upon, the plan of procedure must be well considered beforehand, and the apparatus calculated to effect the different objects got in readiness. This consists of narrow, sharp-pointed knives for the incisions, long, sharp-pointed forceps and needles to carry through the ligatures, and instruments to assist in seizing and drawing them tight: the incisions may first be made or the ligatures introduced previously, according to the fancy of the operator. I have generally pared the edges, given the patient plenty of time to clear the throat of blood, and recover his composure, allowed the bleeding to stop, and the irritability of the parts to abate before interfering farther. The first part of the operation is not attended with much difficulty. The knife held by the further end of the handle is introduced through the edge of the fissure at its anterior margin, and run back to the apex of the one-half of the uvula. This may be laid hold of and made tense by means of the forceps already described. The same proceeding is repeated on the other side, the knife being used by the right and left hand respectively, if the operator can so manage it. The introduction of the ligatures is more easily accomplished in the simple manner here represented,



than by the use of any of the contrivances, forceps, or porte-aiguille's, that have been invented. The needles of different sizes and curves fixed in handles, somewhat resembling those shown at p. 282, are passed through the velum from about a quarter of an inch, or more, from its free edge and towards it. They should penetrate two-thirds of its thickness. This needle carries a double ligature, the noose of which is caught by a blunt hook and pulled out into the mouth, whilst the instrument is withdrawn. A second and smaller ligature is carried through opposite to this, and by means of this second thread, the first and double one is brought through. By a repetition of this proceeding, two, three, or more points of interrupted suture are made. After the edges are put together by one or two points, no difficulty will be experienced in carrying others through both edges by means of a more curved instrument in a handle, or by the use of a small needle, carried in the points of a pair of strong and well-fitted forceps. Before the ligatures are finally secured, the parts being put upon the stretch, an incision should be made on each side towards the alveolar ridge, through the anterior surface of the velum. The dotted lines in the above sketch indicate the position and extent of these. By this method the edges come together more easily, and the strain is taken off the threads, so that there is less risk of these making their way out by ulceration. All motion of the parts should be guarded against as much as possible. The patient should make no attempt whatever at articulation for many days, and his efforts at deglutition should be as slight and rare as possible. The risk of failure is considerable; the parts are not favourably circumstanced for union; their involuntary movements, the moisture by which they are bathed on all sides, are greatly opposed to the process; yet by careful adaptation of the parts, and by the precautionary means calcu-

lated to relax and keep them quiet, a favourable result may often be anticipated.

Spina bifida is a projection from the mesial line on the posterior aspect of the trunk, generally in the lumbar or sacral region, and formed by the dilatation and extrusion of the membranes of the spinal cord, the rings of the vertebræ being deficient to some extent. It may be reduced in bulk by repeated punctures and gradual evacuation of the contained serosity. The patient may live for a considerable time, the developement of power in the lower limbs depending upon the state of the cord; but a permanent cure can scarcely be expected. The operation of puncture is not attended with difficulty or danger, and may be conveniently performed with a grooved needle.

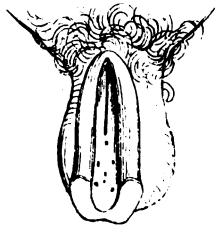
Surgeons are frequently consulted about deformities of the hands and feet; the parts are occasionally redundant. There is perhaps the rudiment of an additional thumb, finger, or toe. This is not attached by any articulation, and not furnished by tendons. The division of the integument with a knife or sharp scissors is alone required for the removal of the deformity. Webs of skin connecting the fingers have to be divided when they are to such extent as to impede the motions. This is done at once by entering a bistoury through the fold at its base, and cutting outwards, or by cutting from the edge to a sufficient depth. There is a good deal of trouble sometimes in preventing the recurrence of the web, or contraction during the cicatrization. I have thought of making a perforation through the web towards the proximal extremity of the finger, and by the introduction of some foreign body, as a piece of thick firm cord, preventing its healing; after the edges have cicatrized, then the remainder of the web might be cut at one sweep, and the fingers dressed separately for a sufficient time.

The openings of mucous canals are not unfrequently closed more or less perfectly; the eyelids, nostrils, ears, are found to be obstructed occasionally, and in such a way that the assistance of our art may be called in serviceably. Occlusion of the anus is by no means uncommon, and the surgeon is of course called upon to

interfere at a very early period after birth; the possibility of affording relief will depend upon the extent of closure. The mere extremity in some cases is covered by a membrane not thicker than the common integument, and the impulse of the contents of the bowel can be felt against the finger when the child cries; the operation is then simple, and consists of making an incision with the point of the bistoury and crossing it; there will be no trouble required in keeping it open, no tents or bougies are wanted. In other cases the rectum is imperforate to a considerable extent—is, in fact, deficient; the large intestine may terminate at the top of the sacrum or somewhere betwixt that and the normal situation of the anus. In those instances an attempt may be made to reach the cul de sac by careful incisions, guided by the finger, but the narrow space does not admit of any deep exploration: the situation of the bladder and the vessels of the pelvis is not to be forgotten; the plunging of a trocar at random is certainly not warrantable, nor is the searching for the bowel, as has been proposed, by incision of the parietes. The imperfection of the bowel is often considerable, and this is not unfrequently coupled with other malformations and displacements of viscera.

The imperfections and malformations of the genital organs in both sexes furnish frequent opportunities for the exercise of the surgeon's skill and dexterity. The urethra in the male organ is very frequently not carried forward to the proper situation of the meâtus—of which, however, there is generally a vestige, even a blind canal of some length—but terminates somewhere behind the glans in the situation of the frœnum preputii; half an inch or more may be wanting to complete the passage; the functions of the part cannot all be properly fulfilled; very often the whole urethra and bladder are rendered irritable, and are drawn into diseased action; alteration of structure follows as a necessary consequence; this may be attributable to the narrow condition of the orifice, or to the exposure of part of the mucous membrane, to friction, and various irritations. The prepuce is generally deficient in these cases, or so short that it does not protect the glans. This hypospadias, as it is denominated,

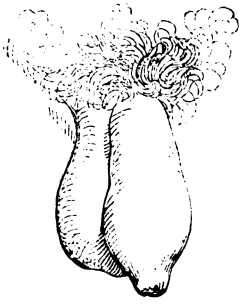
can occasionally be remedied; attempts have been made by perforating the glans in the course of the natural canal, and by the insertion of a tube, to carry forward the current and elongate the urethra permanently; this method does not answer; there is a want of substance in the part, and sloughing is generally the consequence of the attempt. I have sometimes succeeded, and in cases where other means had been tried unsuccessfully, in protecting the exposed and irritable lining membrane of the passage, and carrying that forwards to the apex of the organ by turning back a portion of the prepuce and uniting it without any twist, the lining membrane presenting outwards; patients have been thus relieved from the frequent calls to make water, the nocturnal emissions, and other unpleasant consequences.



This deficiency, epispadias, is very rarely met with; the subjoined sketch represents a very complete instance of it; nearly four inches of the urethra were exposed, the mucous membrane not being much changed, perhaps a little paler, and with its lacunæ beautifully perfect. The man was about twenty-three years of age when he applied for relief; he wished at first to make it appear that the affection was the result of injury; but after submitting to an operation, which was most perfectly successful, he acknowledged that it was a connate deficiency, and attributed it to some impression made upon his mother's imagination. The operation consisted in paring the edges thoroughly, and putting them together over a catheter, by the introduction of many points of twisted suture. I saw the patient some years after the operation, and touched for him, with a heated needle, a very minute fistulous opening near the pubes, through which not more than a drop of urine oozed during micturition; this had the desired effect, and the organ was then, as he stated, in all respects and for all purposes as perfect as he could desire. The prepuce, when deficient or short, may be supplied or elongated, as recommended by Celsus, by circular incision of the skin of the penis

near the pubes, and by sufficiently tight ligature round the orifice of the prepuce; though, as he has stated, the difficulties of attaining the object must be considerable when the organ is of large size and the covering scanty.

The prepuce is generally in fault otherwise, from its inordinate length and the tightness of its orifice; the elongation is often enough a consequence of the constriction, which is sometimes so great as to present a serious obstacle to the flow of urine.



Other annoyances arise from this condition of parts, phymosis, as it is termed: accumulations of secretion from the surface of the glans and prepuce take place, and these become acrimonious; inflammation arises, followed by puriform discharge from time to time—a spurious gonorrhœa; the surface is apt to become ulcerated, and in advanced life, these ulcerations not unfrequently take on a malignant action; as in other situations the ulcers may sometimes be induced to cicatrize, but the lymphatic system has become contaminated, and the patient perishes at no distant period. When the orifice of the prepuce is only constricted to a certain extent, it may by an effort of some kind be brought behind the glans. From this change in the relation of parts, great pain and swelling of the organ ensue, discoloration of

the glans, infiltration into the loose cellular tissue, under the lining membrane, which is now anterior to the stricture; in other words into the displaced surface of the prepuce, and under the integument which is behind it; two large rounded masses are thus formed, with a deep indentation between them; this displacement is frequently met with even in boys, and causes great alarm

from the accompanying swelling and distension of the organ. These affections, phymosis or paraphymosis, are often met in conjunction with venereal diseases. The orifice of the prepuce, perhaps pretty lax in its normal state, becomes contracted in consequence of inflammatory œdema, caused by the mismanagement of sores or discharges. The orifice may have been ulcerated, and by the contraction attendant upon the cicatrization, it is more or less closed. Great inconvenience arises from phymosis when sores exist, and occasionally the patient gets into a much worse predicament by uncovering the glans, and permitting it to remain in that state for a short time; rapid swelling ensues from the obstruction to the venous circulation; the glans assumes a dark appearance, and the breaches of surface are rapidly widened by phagedenic action or sloughing. Great part or even the whole of this most important part of the organ may thus be lost. The congenital phymosis, if not very complete, may be got the better of by a little attention on the part of the patient, by the frequent retraction of the membrane, and gradual dilatation of its orifice, not forgetting careful ablution. When there is abundant secretion of matter from the surfaces and from sores, the employment of a syringe must be recommended, by which slightly astringent tepid lotions should be frequently applied. In the state of inflammatory œdema, suspension of the organ, even confinement to the recumbent position, with active constitutional treatment, must be enjoined.

In cases where the contraction, whether connate or accidental, is very obstinate, where it is an object to expose ulcers or warty excrescences situated underneath, or in cases where the inflammation runs very high, the swelling is great, and threatens to terminate unfavourably, or, with the view of permitting discharge to escape, and of making proper applications to diseased parts, it will be proper and necessary to make an incision through the covering; this is resorted to so that the glans may, at all times, be readily uncovered. Again, it is often called for in order to put a stop to the progress of sloughing. When the parts are

unaffected by swelling, the skin moving freely on the subjacent membrane, and it is judged right to widen the orifice by incision, the prepuce should be slightly stretched, and, the object being to divide the two layers as nearly as possible to the same extent, care should be taken that the skin is not unusually elongated. A director with an open end, previously dipped in oil, is then slipped betwixt the prepuce and glans, close by the side of the frænum. The end of this instrument is felt at the reflexion of the membrane, (great care is to be taken that the guide has not entered the urethra, a very serious mistake, and one which, I believe, has actually been made,) and a sharp-pointed bistoury, narrow and curved, is slid along the groove and passed through to the surface; by one sweep, after the blade has been freely pushed home, the division is made. A point of interrupted suture is made, with a small needle, on each side through the skin and lining membrane, in order to prevent their separation, and thus expedite the cure. These are removed in thirty or forty hours, and the tepid water dressing applied, the organ being suspended, to favour the return of blood and prevent œdematous or inflammatory swelling. The incision is made in the same direction, with the same instruments, and in the same manner, in all respects, in the other forms of phymosis. This method is preferable to any other, in so far that the division required to effect the object is shorter, and the glans is not afterwards left so unprotected, as when the incisions are made on the dorsum, or towards the side. Independently of the annoyance arising from the glans being always exposed after the operation, the mass of prepuce, left hanging awkwardly on one or either side, proves troublesome; this last objection may be obviated by complete circumcision, but the operation is a painful and very severe one, when practised on the adult, and one which many patients would not choose willingly to submit to. There is no necessity for making any suture, after the operation, on the parts, when diseased and infiltrated.

The reduction of paraphymosis is effected without diffi-

culty when the displacement is recent, and the tissues are still loosely connected. The object is to diminish the bulk of the swelling beyond the stricture, and to bring that, composed as it is of the free edge of the prepuce, forward into its normal position. This is effected by grasping the body of the penis, behind the swelling, with the fingers of one hand, a napkin being interposed, the back of the glans penis is smeared with liniment, and gently, but uniformly, squeezed with the fingers expanded. After the swollen parts have, in this way, been rendered flaccid, an attempt is made to bring the constricted part forwards over the corona glandis, whilst that body is pushed back through the tight ring of the prepuce. This cannot safely be tried, to any extent, when the glans is ulcerated extensively. There is a period, at which the attempt cannot possibly succeed, when the tissues are infiltrated and filled with lymphatic deposit, and the stricture has cut deeply, by ulcerative absorption, into the swelling. In all such aggravated cases it is the best practice to divide, at once, the narrow stricture: and this is done by separating the two swellings, already spoken of, and passing the point of a small knife betwixt them. The reduction is then accomplished, in the more recent cases, with great ease. In others, though the parts cannot be placed in their normal relations, the danger to the glans, from extensive ulceration or sloughing, is obviated; suspension of the organ, fomentation, and antiphlogistic treatment, will soon bring the irritated parts into a quiet state.

Occlusion of the vagina, the principal and most troublesome malformation in the female parts of generation, whether congenital or accidental, the result, perhaps, of adhesion of the raw surfaces, in early life, or contraction of sores, is perfectly remediable. There is generally some vestige of an opening, and, at any rate, unless the membrane is very thick indeed, an incision, directly in the mesial line, will reach the canal. It is not necessary to interfere with children labouring under this malformation, as there is always sufficient outlet for the urine; at a

later period, the obstruction of the menstrual discharge, and of the other functions, will be sufficient warrant for operative procedure. There is no great risk of the passage again becoming closed, and no occasion for the use of dressings, tents, or other remedial measures.

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